DRAGON USER

The independent Dragon magazine

January 1988

Contents

Editorial

LOOKING down the tunnel of another year, I am going to quietly forget that people keep asking what's going to happen to Dragon User? and remember that people have been asking that question since 1984 and, like the Christmas turkey, we keep right on reappearing

I shall start worrying about that Great Fricassee Pan in the Sky after Christmas Right now I am staying put under the mistletoe Happy Christmas!

Talking of mistletoe, I had the chance to meet old and new acquaintances at the 6809 Show on Saturday and talk things over Many people agreed that there are opportunities for marketing Dragon software — for instance, producing legitimate, inexpensive conversions of American Tandy programs — which are not taken up because there is a better living to be made from other machines On the contrary, dealers who have good contact with Dragon owners are gradually living off their less profitable games to specialist dealers who are more committed but are inevitably smaller

More information on reliable, good value sources of software and hardware from overseas would be welcomed by everyone now

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How to submit articles

The quality of the material we can publish in *Dragon User* each month will be a very great extent depend on the quality of the discoveries you can make with your Dragon The Dragon computer was launched on to the market with a powerful version of Basic but with very poor documentation

Articles which are submitted to *Dragon User* for publication should not be more than 3000 words long All submissions should be typed Please leave wide margins and a double space between each line Programs should whenever possible be computer printed on plain white paper and be accompanied by a tape of the program

We cannot guarantee to return every submitted article or program so please keep a copy If you want to have your program returned you must include a stamped addressed envelope

Letters

This is your chance to air your viewe— send your tips, compliments and complaints to Letters Page, *Dragon User*, 12-13 Little Newport Street London WC2H 7PP

Writers wanted

I am working on a new monthly magazine for the ol so-serious user called *Dragon Logic* which will come out in January or February I cannot be more specific about the detes because the magazine is run by myself only and therefore it will take longer to put together

Dragon Logic will depend heavily on the readers A vest percentage will be made up of things sent in by readers and suppliers There I are I would urge people to send their letters lop ten software for review news problems etc to me

If readers want to know more about the mag then please write to me

Donald Morrison
72 Drriabught Road
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IV2 3QT
Scotland

Why no '64 games?

I HAVE recently purchased a new Dragon 64 to add to my old 32 and am supnsed that I have not seen any new Arcade and Adventure games advertised in *Dragon User* for the 64 using its full memory capabilities Software houses like Microvision have produced programs for use with Flex Operating System disc drive and Dregon 64 but have not produced any just for the Dragon 64 use The same is with compan es who produce OS-9 software which needs the 64 to work

If brilliant games like *Juxtaposition* can be made for the Dragon 32 just think of the possiblities I or the 64

I hope Software houses read this letter and take note of the points I have made as I do not think I am the only one with this opinion

Richard Tyler
11 Madeira Park
Tunbridge Wells
Kent
TN2 5SX

Every month wa will be shalling out a game or two, courtasy ot Microdeal..to the reader/s who sand the most interesting or entertaining latters So send us your hints and your opinions, send us your hi-scores and suggestions Send us your best Dragon stories What d'you think we are, mind readers?!

EXTRA PUFF

Why oh Why The users cry

I would like to protest about the high pr ces ot Dragon 64s and disc drives A new disc drive costs £200+ with DOS cartidge and a new Dragon 64 costs £195 Why? Surely companies would sell more products if the prices were lowered No wonder there is a booming trade in second hand 64s and disc drives

Remember one of the other computers — the Atari 800XL You know the one where programs on cassette take a long time to load Like *Internationel Karate* in 20 minutes A few years ago its popularity wes dying and the makers decided to drop the price and now it has recovered and is selling well Shouldn I this approach be adopted for the Dragon to get it back in the shape so that the user base increases to what it was back in 1984 or even treble that?

I have noticed some games for the Dragon and CoCo from Software that are quite good One is *Brew Master* by Tom Mix and others are *Zaxxon* and *Pooyar* by Datasoft Why hasn t someone bought them to sell in the UK as they are brilliant games up to *Shoot Trespass* standard

I would like to congratulate Quickbeam for *Superkid* and *Fire Force* (yes, I do like it) and Microdeal for *Airball* and also the other companies for still supporting the Dragon

My final point is regarding Dragon shows Why hasn t anyone (except Microdeal) put a Dragon show on in Birmingham? It does cost you know I think it s ideal — central easy for most people to get to and probably cheaper than London Is it a case of anything north of Watford Gap (and more recently South of Ossett) is ignored?

Mr K Hunt
11 Demarnham Close
West Bromwich
West Midlands
B70 6AX

We a trongly auepect that the enewer to most of your questions is that Aterl meneged to develop into e very strong and successful compeny before it ren into rocky watere where as Dragon Data did not enjoy half so much success before trouble hit them It helpe to have friends at the bank if you want to re-launch your products

In reply to your other question, whet? You mean there really is something between Watford Gap and Ossett? I thought it was all just Birmingham Seriously though—why doesn t someone put on a show at the NEC? It s central, purpose built, plenty of room to park but have you *tasted* their Cornish pasties?

Now we do the homework!

I would l ke to compliment you on an excellent magaz ne and I think Octobe s issue was probably the best for ages Not only packed w th interest ng in formation it also helped me complete a maths GCSE problem!

The problem was to find the amount of triangles in a diagram and work out e solution I was given the problem on 24th September, my Dad and I were stumped until lo and behold the *Dragon User* arrived the very next day! Looking at the competition I saw e little teble accompanied by a large diagram When I read the passage next to it there was my problem and equation neatly documented for me

Keep it up Gordon much appreciated

Daniel Swan
116 Upland Drive
Derriford
Plymouth
PL6 6BG

Bulletin board bulletin

WHILE I was working an idea struck me After a while I regained consciousness and it was still there so I thought I would tell you about t How about a bi monthly page devoted to bulletin boards Readers could be encouraged to send in details of the boards that they use and a list of active boards published Also special features of particular boards could be highlighted I don t know how popular it would be but it may be worth a try

K G Smith
33 Glack Road
Deal
Kent
CT14 9ND

IF anyone wents to send us details on their bulletin boards we'll print them We have something on BBs in the pipeline, in fact As soon as I can find a bent coathanger, I'll try and fish it out

Trans-atlantic Telegraph

I should like to react to a letter by Mr Randy Longshore in the July issue of *Dragon User*. He comments on my CoCo/Dragon Basic converter published in the April issue.

Of course Mr Longshore is correct when he states that a Dragon cannot read CoCo discs at least not directly. I take great interest in his procedure to modify CoCo discs to be loaded by a Dragon and will most definitely contact him in this respect, especially since I myself have just begun work on a program that would copy all files on a CoCo disc to a Dragon disc. However, though a Dragon user indeed needs to find a CoCo disc user who is prepared to copy files from disc onto cassette, Mr Longshore's opinion that my program would then be more or less superfluous oversimplifies matters.

First of all I should like to emphasize that not all Dragon users own disc drives and that they can use my program even though it tries to deal with disc Basic tokens as well. Moreover, not all Basic software need necessarily come from a CoCo user. With my program the Dragon user also gets access to commercial software written in Basic, eg the compilation tapes published by, among others, the American *Rainbow* magazine. This gives the Dragon user the ability to tap into the immense software pool available for the CoCo, albeit in a very limited sense.

Far more important, though, is the fact that it just will not always do to ask a CoCo user to save Basic files in ASCII. It occurs quite frequently that Basic programs which have been packed by removing superfluous spaces and by combining Basic lines get corrupted by saving them in ASCII tokens are replaced with longer ASCII text and long lines may overflow with the result that ends of lines may be chopped off while saving to cassette. This may even happen with 'normal' programs which have very long lines. This is not conjecture but sad experience and was one of the minor reasons for writing my converter in the first place.

I appreciate Mr Longshore's interest and feel that readers of *Dragon User* can only profit from this kind of exchange of information in the only large-scale medium available to Dragon users. I am of course interested in further comments or suggestions as regards my program.

Rudy Duyck
Abdijbekestraat 8-C2
B-8200 Brugge 2 (St Andries)
Belgium

Screens x 4

SINCE light pens for the Dragon are common amongst us, I would like it that someone out there will write software to create graphics on four PMODE4 screens linked together. You will be able to see only the usual grid size but can move around the screen that will be a grid of 256 + 256/192 + 192. There is better way but more complex by moving around with a kind of spying glass that will double every dot's height and width. But you will be able to look at the whole screen. Got it?

I'm writing for you! Oh brave ones. Please send what you have done to DU.

Ofir Rahar
Herev Leat 34
Emek Hefer 38860
Israel

Where is Tandy?

COULD you please include the address of the Tandy User Group in your next issue of Dragon User. I have tried every address I could find to try and track them down without luck and so I wrote to you.

Craig Dillon

HAVING made enquiries, it seems that the Tandy Users Club no longer exists in this country. I am told that one of the Northern Dragon Clubs inherited some of the membership of the old group, but I am not certain which one or what the address is at present. I will let you know as soon as I can find out. Also, the National Dragon User Group deals with Tandy as well as Dragon interests. They are at 6 Neverino Road, Worthing, Sussex.

Range right

MAY I take this opportunity to give a poke to control the cursor link rate on the 64? Location &H FABA controls the rate: poke it with 1 to give a cursor that does not vanish when you hold down the space bar, and POKE 283,55 to update the checksum. POKE &H FABA,0 POKE 283,55 to turn off the cursor.

I also send a right justify routine which will take a line to A$ and justify it to a line length contained in variable LN, returning the justified line in B$. Has anyone got a better method?

```
100 RIGHT JUSTIFY
110 A$ = "This is just an
    example"
120 A$ = A$ + " "
130 LN = 32: F = 0: S = 0: N = 0
    P = 1: L = LEN(A$): B$ = ""
140 GOSUB 260: GOSUB
    290: IF F = 0 THEN 170
150 S = S-P + F: P = F
160 IF P) = L THEN
    N = N + 1: GOTO 140
170 IF N = 1 THEN 310
180 P = 1: GOSUB 280
190 SP = LN-S-P-N + 2
200 B$ = B$ + STRING$
    (P-1,32)
210 DS = (INT(SP/(N-1))
    MS = SP-(N-1)*DS
    ASS = 1
220 GOSUB 290: IF F = 0
    THEN 300
230 B$ = B$ + MID$
    (A$,P,F): P = F
240 GOSUB 280
250 IF SP = 0 THEN
    B$ = B$ + " ": GOTO 220
260 IF PASS) = MS THEN
    B$ = B$ — STRING$(DS +
    2,32): SP = SP-DS-1
    PASS = PASS + 1: GOTO
    220
270 B$ = B$ + STRONG$
    (DS + 1,32): SP = SP-DS
    GOTO 280
280 IF MID$(A$,P,1) =
    " " THEN P = P + 1: GOTO 280
    ELSE RETURN
290 F = INSTR(P,A$," ")
    RETURN
300 B$ = LEFT$(B$,LN)
310 A$ = B$: PRINT A$
```

Fjord calling

THANKS for many excellent magazines. I wish to thank all software writers/publishers for all the supberb games/programs that have arrived. One year ago all my Commodore owning friends teased me because of the quality of the Dragon games. Now when they have seen *Shaolin Master Plus Ice Castles* and others, they regularly come to me to play my Dragon games. I even have an Amiga-owning friend who likes my games.

And a last thanks to *Dragon User*. I read every page of it every month.

Continue like this!

Tor Helge Skei
Ustaasen 27
7082 Kattem
Norway

Norway club

WE would like to tell you and your readers that there is a computer club for the Dragon and Tandy CoCo in Norway.

We have a monthly newsletter. We have members from all the countries in Scandinavia. We'd like to get in touch with other computer clubs all over the world.

If you want to know more about our computer club and what we are doing, please write to use for more information.

Tromso Dragon/Tandy Club
Sandneshamn
N 9105 Eidkjosen
Norway

Tyne and here

JUST to prove that the Dragon has still got a healthy following could you please give a plug to my local club the NORTH EAST DRAGON USER'S CLUB. We have 14 members and meet every Wednesday at 8.00 pm in the Etterick lounge of the Grindon Mill Chester Rd Sunderland. If anyone can make it we would be pleased to see them or they can contact me.

Chris Jobson
23 Walsingham
Biddick Village
Washington
Tyne and Wear
NE38 7HF

SUPPORT your local Dragon club

News desk

If you have any new products for the Dragon — software or hardware — ring the News Desk on 01-437 4343

Harris front end KLIKs

HARRIS Micro Software's new complete front end and line editor called the KLIK Utility is now available

The package features point and click operation of the entire system from the keyboard or a mouse, with pull-down menus pointers, a dialogue box control buttons and help messages a selective directories, file icons repeating DOS commands and a set up module for easy control of the screen, windows, BREAK, etc

The word-processor like line editor has trace and pause facilities and desktop facilities include a disc based spooler, memopad snapshot and KLIK Basic which allows you to design your own windows icons and menus

There is however no snapshot function as featured in one of our advertisements Bob Harris says that he will give some thought to whether or not he should include it when he works out what it is

The package costs £14.95 from Harris Micro Software 49 Alexandra Road Hounslow Middx TW3 4HP Bob Harris's Basic 42 was one of the best Dragon packages of 1986

More from The Solver

SIMON Hargrave is pleased to announce the arrival of his latest adventure for the Dragon 32 and 64 the fourth in the *Star crash* series

The Heir of Tyos is an unusually large 200-location adventure in real time with many assorted mobile characters and events some of them interactive The split level parser will accept full English sentences

You play the Prince of Tyos places inside a mysterious pyramid by a rival monarch To win peace for your kingdom and the kingship, you must succeed in escaping But your rival is devious and not to be trusted To find the mysterious Amulet of Tyos is easy but escaping alive is more difficult

The game is randomised so that it will play differently on each occasion Do you asks Simon Hargrave, dare to accept the challenge?

This and all Simon's games are available for £5 each (includes p&p) from Crawley Hill Farm Uley Dursley Glos. GL11 5BH

New editor for Dragon Update — same old plea

THE November issue of *Dragon Update* looking white and shiny has just dropped out of the postman's bag and onto my foot Pity it's bundled up with two cwt of other mail Why am I standing so close to the postman? I'm not — I had to carry it up the stairs myself Our postman may be late, but he's not stupid

This is the first issue by new Irish editor J Barry Caruth and Paul awards him eight out of ten for effort which is fairly pressed This month's issue features Pascal for Beginners (part 4) Memory Management on the Large Dragon Easy Machine Code part 14, Forth part 2 a report on disc controllers (DOSs) some notes on the Touchmaster Graphics pad, a couple of games reviews a supportive assessment of Dragon User since the Great Change (it's nice to meet someone who can live without a full colour cover) and some thoughts from Paul Grade on copyright and circulating material And yes Paul you're right we professionals do have someone to make the coffee for us He's called Russell Hobbs and if anyone would like to organised a whip-round we could buy him a new lid for Christmas

Barry is, as usual, appealing for more material Somewhere I have a box of fairly old submissions which just missed being published and which the owners did not ask to be returned I wonderidly if DU would be interested in looking at some of that

Contact NDUG at 6 Navarino Road, Worthing Sussex or send material to Barry Caruth 132 Doneghadee Road Bangor Co Down N Ireland BT20 4NH

Harrry Whitehouse upgrades his power supply for the same price

THE famous A1 Supasmooth Heavy Duty Power Supply has gained a couple of extra features at no extra cost thanks to Harry Whitehouse

The A1 which carries a two year guarantee and lifetime service warrantry is suitable for the Dragon 32 and 64 and recommended for all Dragonplus owners

It now features a rapid red button on/off switch as standard This means that the Dragon's own fault-prone switch can be left permanently on reducing the risk of failure

A new design of D-connector has also been introduced, with a reliable cable clamping arrangement instead of a grub screw

The A1 Supasmooth still costs £18.95 and £2 flat rate post and packing It is manufactured by Peaksoft and is available from Harry Whitehouse 46 Queen Street Balderton Newark NG24 3NS tel 0636 705230

"Quite a few owners have told us that they are purchasing an A1 as a backup for their original Dragon until but we always suggest they use the A1 and put their old unit in the cupboard After all if an A1 ever failed — and to our knowledge that has never happened — the user will at least have the security of knowing that it is covered by the guarantee On the other hand if a Dragon Data unit fails all you can do is throw it in the dustbin" said Harry

69 Microcosm this month

68 MICROCOSM the journal of the 68 Micro Group has also just turned up Contents include An Extensic Flex Disk Format Program a look at the Atari 1040ST disk-Type reporting letters 68 Micro Group Library a guide to the use of 6821 PIA control register bits Coco 3 update review and some news and personal system reviews The group holds regular meetings in the London and Birmingham areas

For information contract Keith Barnes 174 Glen Albuyn Road Wimbledon London SW19 6HG

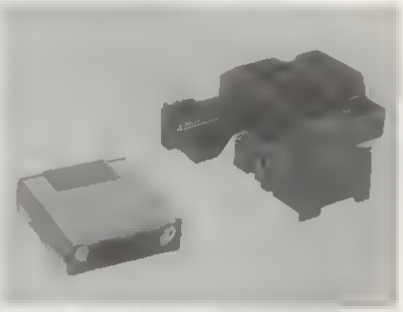


Image scanner from Epsom

FOR the wealthy and ambitious in the desktop publishing world Epson have come out with a low-cost entry level Image scanner as an option on four of the company's printers the EX800/EX1000 and the LQ2500/LQ2500+

The bundled software with the scanner is surprise surprise compatible with IBM PC compatible machines and the device costs under £200 and can read areas of 8 x 11in with the EX1000 and LQ machines and 6 x 8in on the EX800

September stats for subscribers

AS many of you will recall we had problems with September 1987 edition of *Dragon User*. We are aware that a few subscribers had not received their copies well after the date of posting and that these copies may not turn up. We had a grand total of two returned to the office which have been found good homes.

The contents list of that issue follows. Would any subscriber who did not get his or her copy and wants a photocopy of any article or articles listed below please drop us a line quoting their subscriber number and we will in due course get copies of the relevant articles to them. No sae required.

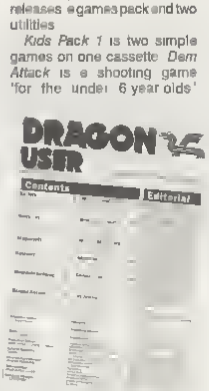
Please act quickly on this offer as we only have one copy here, with its back cover missing, and if we lose that one, we are stuck.

Letters Stuart Beardwood's music offer hi score corner News minor correction to Mr Walker's article in July 1987 Dragonsoft Magbase by Pulsar, Data Retrieval System by Grosvenor (both utilities both good reviews) Datasort mammoth home grown database program in Basic Mountain Building program draws up landscape contours and slices Dragon Answers converting Tandy code for Dragon Basic modifying Windows, LIST/LLIST protection, On Error Run facility, Winners and Losers April comp, Dumps for Epson FX-80 Tandy Colour Graphics Printer Tandy CGP 115 Write Adventure descriptions and moving characters, Adventure Trail Total Eclipse Juxtaposition Aquaneut 471 Competition page factors and number sequences The Answer to the June comp, Communication Adventure Contact

Three more packages from Dragonfire

DRAGONFIRE Services have come up with three new releases a games pack and two utilities.

Kids Pack 1 is two simple games on one cassette. *Dem Attack* is a shooting game 'for the under 6 year olds'.



Graphical Hangman is a version of the old favourite that used to waste so much chalk is designed to appeal to older players as well as kids. Over 1000 words in the memory. £2 for two games.

Small Business Word Processor is designed for use in the home and by small businesses. Features include tabulation, user defined page configuration and audio typist! It says here although it does not say exactly what this means. Free typist with tape? Who knows. There are also the usual save, load, edit, print and view functions. The package costs £4.

Small Business Telephone Directory is a database program for strong names, addresses and phone numbers. Functions include view, edit, sort, add, delete, save, load, search and print in list or label format. The package costs £4.

Dragonfire are also looking for fresh software to publish and are offering royalties of between 15 and 33%. Send for details without obligation to Dragonfire Services, 13 Parry Jones Close, Blaina, Gwent NP3 3NH. Dragonfire Services also run *Dragon Magazine*.

Dragonsoft

New software for review should be sent to *Dragon User*, 12-13 Little Newport Street, London WC2H 7PP

Trapped in a castle with The Mad Cook

Title *The King's Quest*
Supplier Simon Hergrave, Crawley Hill Farm Uley Dursley Glos GL11 5BH
Price £5.00

THIS is the second in a series of four adventures by the Solver himself. Knowing that he hasn't even solved the fourth one himself without cheating suggests that the others might not be exactly simple.

After a few loading problems (if my end (young Hargrave's probably sending someone round with a large mallet to beat up my cassette player at this moment) the game will load and run automatically and then you're free to roam the castle mainly at your leisure.

In this program you play the role of Kurgan who is still trying to get home after being helped in *Starcrash* (the first title in the series) and who has now got himself trapped in a vast castle. Your job is obviously to free this hopeless character although this is easier said than done.

Your first location is the courtyard from where you can go north, south or along a narrow side passage. Other rooms nearby include stables, kitchen and library all with their sprinkling of potentially useful objects for you to get hold of.

Then it's upwards via a magnificent staircase to floor of bedrooms and wardrobes. Also on this floor is the tower of Minos which has within it objects like a gold key and brass trumpet but it is deceptively easy to get lost in the mists.

The tower of Minos is easily accessible on the Eastern side of the first floor but your passage to the Western tower is blocked by an inscription on the wall reading a noisy flema in reverse — to progress into the tower simply solve the riddle.

To succeed in this game the art of solving riddles is not the only skill required, but also strategical tactics. For instance there are various violent characters wandering about the castle such as the Mad Cook and the Prince who will frequently come lurching at you. Tactics are needed here to decide whether your strength quota is enough for you to defeat the bounder or whether to flee as quickly as possible — although you also lose your possessions. One person who is slightly helpful is the Philosopher although he also disappears too quickly.

As well as you strength other *Ring of Darkness* style features are the fact that you need a minimum score and experience level to win although that to be stressed that these minimums are not the maximums. Weight is another problem — not the size of your stomach but how much you are allowed to carry. Some objects naturally weigh more than others such as the anvil found in the first location which weighs 2000 of a possible 3000 units not leaving you hands free to carry much else.

The only problems with the game are the short time you are given for your responses the time passes message often appearing while you're entering a command the text has not been redesigned but this can hardly be called a fault.

Otherwise there's not a lot wrong with this game. One particularly useful feature is the 'list' command which displays on screen all available verbs, thus helping you find the right phrase when you know what you want to do but can't find a way to do it. This feature is just one indication of how much time and thought the author has put into this well designed game which is well worth taking a look at.

Philip Stott

Follow the road from The Solver's Arms to Purley

Title *The Quest For The Meaning Of Life*
Supplier Simon Hargrave Crawley Hill Farm Uley Dursley Glos GL11 5BH
Price £5.00

NUMBER three from Hargrave esquire — he's getting as devoted to writing adventures as he is to solving them.

Starcrash wasn't too hard to, about the first 74 locations. *The King's Quest* wasn't too difficult until all and sundry started attacking you. This latest quest isn't too hard until about the first location (it's a good job the author also supplies solution sheets although I haven't resorted to them yet — emphasis on yet).

What sets this apart from the previous two games is that there *Tanglewood* sequel you have not one but four characters to control all of which have their own skills and aptitudes. You can switch between these characters by use of the 'persona' command and each can do such things as eating and sleeping with problems that can require not just one but two of the characters to solve them. The quartet can also split up and go their separate ways by using the command 'wait'.

The game begins in the Solvers Arms public house with a landlord called Thhyhr (poor chap). Unfortunately your characters start getting philosophical and are told to disappear into the night. So off you characters trek with odd articles like a crowbar tucked into a handbag and with four controllable characters you have four times as many hands and pockets.

So out into the world you go onto the A47 (luxurious setting for an adventure) on the seemingly endless road to Purley (*and a long and chilly road that one is too — Ed.*) with only a policebox in sight. Now that policebox is bound to be useful isn't it?

After ignoring the first rule of advertising — to examine everything — I eventually managed to find the meeting place by disappearing down a nearby manhole and reappearing in a park.

Lurking in this park is a wall of worms (that's what it says) and a row of marching hammers (that's what it says again!). Indeed there is a mad sense of humour apparent through out the game slightly reminiscent of that old devil *The Cricklewood Incident* except that it is harder and more playable.

There are only fifty locations here less than in the previous two games although each seems to be unique rather than certain repeated ones as in *Starcrash*. As the game is more complex though the reduction in locations is natural.

The 'list' command is here again revealing 49 commands this time all of which can be entered in three letters for example 'transfer' = 'Tra'. As with *The King's Quest* the game is written in real time and therefore if you ponder too long life passes you by will flash up on screen. If the pace is too quick though you can always hold and mop your brow.

There is however no score feature so you can see how little of the game you have managed to complete especially when you're not sure what you have to discover to end your search.

So that's the third in the series, not as easy to get immersed in as *The King's Quest* but more complex and challenging certainly not a game to knock off in a couple of evenings. As for a rating it's probably 4 like *King's Quest* but as I only gave that four dragons I'll give this five in the hope it will induce you the reader to keep buying software. The next in the series has randomly placed objects like *Madness and the Minotaur* — I can't even manage the ones where the objects are static.

Philip Stott

Expert's Arcade Arena

Write to The Expert at Dragon User
12-13 Little Newport St
London WC2H 7PP

GREETINGS viewers Let me start by saying that I hope you are all about to have a Merry Christmas and a Happy New Year though I haven't had a single Christmas present from you (probably because it's only November but that's not the issue is it?)

Moving swiftly to an apology from me (yes I do hand them out occasionally — make a note in your diaries), without my fingers crossed I must say that I'm sorry that the Arena has been on the air somewhat irregularly recently but fear not for I'm here for another series (however long) Don't forget to tune in every month

All this crawling is leading up to an appeal I've finally got a round tuit and decided to broadcast some requests for help on behalf of myself and (mostly) my devoted public. If you can offer any solutions then please send them in My postman has now recovered from his hernia and gloats as he walks past the hospital without even delivering a single entry form for the Readers Digest Prize Draw The warehouse I bought last year to store all your letters in is now so empty that I've rented it out to film Michael Jackson videos in!

So below in glorious technicolour black and white is the list of essentials that I'd like you my loyal servants to help with if you can

Expert pleads

1) An answer to the question What does Eddie do on completing level 5 of *Back Track*?

2) Does Universe II of *Total Eclipse* really exist?

3) A program using the information of so many years ago (DU November 1986 to be exact) concerning the way screens are stored on *Chuckie Egg* to make a screen designer

4) What are the codes at the end of each screen on *Time Bandit*? (Sounds familiar!)

5) A map of *Jet Set Willy II* I believe that this isn't an official game so don't try to buy it but there seem to be millions of copies in circulation

6) A list of the information that you receive while playing the game section on *The Death Mines of Sinus*

7) Any POKES at all for any of the following *Mud Pies Ugh!, Glaxxons Cashman Screaming Abdabs Superkid Electron Miser's Dream*

8) More maps How about one for *Module Man*?

9) The official solution to *Escape* 10) A way of upgrading the old *Boris the Bold* to the better version without power surges

Not too herd

Now it all or any of that lot's too hard for you how about something you can all answer regardless of IQ HQ, nosiness etc.? This is your chance to vote in the event of the year **The Expert's Trivial Software Survey**

All you need to do is copy out the questions below along with your answers of course and send them to the usual address where the editor will get them muddled up with the competition entries They will then be forwarded to me and evaluated by my own fair hand with a little help from Giveup my computer

You may send in as many entries as you like so long as you use a different name address and style of handwriting for each

Here are the immortal categories for which you must nominate a winner

1) Best arcade game for the Dragon — from the year dot to 1988. What has been your favourite game?

2) Worst Arcade game — yes, I want to know what is the most utterly atrocious game in the history of the Dragon

3) Favourite Programmer — you could say it's a little unfair to single out someone as the best Dragon programmer but there are a lot of good programmers out there, and it's about time those who've been working the hardest should get some credit Here's a few suggestions Kenneth Kalish is well known for games such as *Invaders Revenge, Danger Ranger Escape Phantom Slayer Devil Assault Cuthbert in the Jungle* and more.

Best Programmee

Roy Coates has produced some good games — *Menic Miner Jet Set Willy Bean Stalker* etc More recently Jason Falcus has made a name for himself with titles such as *Miser's Dream (which we are still trying to obtain copies of from Microvision — Ed)* and *Eddie Steady Go* John Martin is another faithful choice famous for *Moon Cresta* and *Jet Boot Cohn*

There are many programmers to vote for, but why don't we see their names on adverts? Usually just the name of the game and the software house appears which brings me to the next category

4) Best Software House — I considered splitting this into two parts, those surviving and those who have given up but decided to make it a mixed bag Here are a few ideas Microdeal (*Airball The King Time Bandit Speed Racer* all the *Cuthberts*) Incentive (*Moon Cresta Kat Trilogy Back Track, Eddie Steady Go*) Quickbeam (*Superkid Shaolin Master Fire Force*, the *Dickie* series) Tom Mix (*Cuber Buzzard Bait Electron Kater piller II*) Blaby (*Olympia Boulder Crash Kama-Karzy Kung Fu*) Don't forget of course Hewson Salamander Peaksoft Design Design Morrison Micros Melbourne House and Mastertronic (oh sorry misprint. Did I say Mastertronic? I meant to say Software Projects) who have all produced some great games

5) What's the most annoying aspect of any game? For example the fact that you can't play *Hungary Horace* without cheating you can't use a joystick for *Olympia* and you lose all your lives if you die at a monster's start position on *Jet Set Willy*

6) Most underrated game — which game was under advertised undersold but is really good? Here are a few ideas *Beam Rider Pogo Jo, Hotel on Mayfair Darts, Ice Castles, BC Bill*

7) Most overrated game — which game turned out to be least like its adverts? My suggestions would be *Hunchback Drone Datatenk Space Shuttle Module Man*

8) The game you would most like to see converted for the Dragon — there are a lot of good arcade games not yet in Dragon versions What would you most like to be zapping to by this time next year? For example *Chuckie Egg II* (various computers) *Phoenix* (arcade)

9) Best music to zap to Type AUDIO ON before you load/EXEC a game, then insert a music cassette during play, and you should be able to zap away with a musical accompaniment This is a long standing question and should be resolved once and for all

10) Program which you would most like to see hacked — write and tell me which game you would most like a cheat for and I'll challenge the many hackers out there to see who can come up with the goods first.

11) Best game printed in DU — there have been some great games such as *Flee Flee Cupid Atom Hunt* printed in DU Which is your favourite? (By the way how about some hacks for games printed in DU?)

Expert enewers

So there are the questions. Send off your answers to reach DU as soon as you can and I will do something about them as soon as I can

That's all for this month Thanks for all your letters keep them coming in I'll be back next month with the usual hints and tips Goodbye

Introducing Modems

Ken G. Smith takes the computer to the phone

NEVER in the short history of micro-computers has a peripheral created more interest than the modem. The word hackerˈ entered the language and headlines were made by people leaving naughty messages in VIPs electronic mailboxes. A young hacker in America managed to get into the Pentagon mainframe and was arrested by the FBI or so the story goes. Hollywood took the fantasy one stage further in the film *War Games* with visions of a nuclear war being accidentally started by a young man with a micro. So much desire has it created that for some people it is the first gadget they buy. For those of us that for one reason or another have only just joined the on-line set or more importantly those who are considering joining, I hope this article will help you to find out what a modem is, what it can do for you and what you can do with it.

How it works

When it comes to computers the advertising people seem to fall into the trap of assuming that we are all experts so the first job is to explain briefly how the modem works. The name is an abbreviation of 'modulator/demodulator' and what it does is to transform the binary ones and zeros into sound frequencies in a similar way to that used by the cassette port. The system uses a higher pitch for a one and a lower pitch for a zero. Using this system the computer transmits its information down the phone line and reverses the operation converting the sound waves into ones and zeros, to receive. The rate at which this data is exchanged is called the baud rate and is quoted in bits per second one bit being a single one or zero. Baud rates are being quoted less and less these days and are being replaced by 'V' numbers which at first sight seem even more confusing. A brief guide follows.

V21 baud rate 300 receive and transmit very popular with modem users in America and early users here, now losing ground to V23.

V22 baud rate 1200 send and receive little used at present but gaining popularity.

V22bis. This is a business users system for people whose time is money and sends and receives at 2400 bit per second.

V23 often quoted as 1200/75. This is the most popular system. Receiving at 1200 baud and transmitting at 75, it is used by most view data systems and many bulletin boards.

Full duplex. This is a must for a truly interactive system and I do not know of any modems that do not have at least one full duplex mode. Some will operate full duplex in V23 and half duplex in V22. The difference is most easily explained by comparing the difference between the telephone and a two way radio. On the telephone both users can talk at the same time, interrupt each other and even argue (full duplex) whereas on two way radio one operater must give an end of message signal and cease transmission before the other can speak (half duplex). In fact with a half duplex system if both parties try to transmit at the same time nobody gets anything just with the radio. Advertisements sometimes use 'Full Duplex' as a means of indicating that the machine will send and receive at the same baud rate at the same time.

Xmodem. This is a protocol governing the way information is transmitted and received. It makes data transmission more reliable (not infallible), and allows your Dragon to talk to any other machine. As long as they are both using the same baud rate and the same protocol any make of computer can converse with any other. Most bulletin boards operate on Xmodem system.

Auto-dial. speaks for itself really as it enables you to keep a personal phone directory on your computer. Once programmed the machine will call anyone you tell it to call which also means that you do not need a phone to operate your modem.

Auto answer. also self explanatory, only necessary if you want to run your own bulletin board. It is important to remember that a modem is operated through the RS232 port so if you have a Dragon 32 you will need an input/output cartridge with this facility.

At this stage of the game you need to decide why you want to get on-line. If your aim is world domination by Friday forget it. The military have switched all their important data onto microwave transmissions and if you can afford to intercept them then you probably didn't buy a Dragon. Erasing the balance on your credit card is not as easy as some might think, it takes a lot of time and knowhow to penetrate such a system and if you are capable of doing that then you are probably not going to bother reading this article. Anyone searching for a reason to get on-line really need look no further than electronic mail. There are several systems available at the moment with more to come.

Viewdata

These usually operate on Viewdata which in addition to text also gives a limited graphics capability. To use these systems you will need to be in PMODE4 so no colour is available. However if like me you use a black and white television and a single colour printer then colour is of little consequence. Most systems will have a local number for you to call the host computer directing your message to the recipients mailbox. When he next uses the system he will be told that there is a message waiting. He can read an reply immediately or save it to disc to be dealt with later.

Bulletin boards

Another useful pursuit comes with the use of local bulletin boards. These normally operate on an Ascii scrolling screen principal using the normal text screen with file transfer under the XMODEM protocol. Here you will find sales and want ads, programs for you to download, pieces to air your views to the world and above all a lot of people willing to help each other just for the pleasure of doing it. Some boards will expect some form of subscription but most are free. Many special interest groups set up their own boards. My local one was set up with dentists in mind but the systems operator or sysop doesn't mind people with other interests using it.

The adventurers among us will love another facility that is available to modem users, namely MUD. Short for *Multi User Dungeon game*. This is similar to *Dungeons and Dragons* or an adventure game but this time you are not just playing against the computer. Everyone that plays the game has their own identity within the game and the participants play against each other with the computer acting as referee. There is usually a subscription to pay first but to the hardened adventurer the infinite variation will make that worthwhile. Armed with this knowledge and the fact that some of the long standing bulletin boards still use V21 you should be in a position to decide which device you want to buy.

Software

Once you have settled on which modem to buy you will need the software to drive it. If you are lucky it comes with the machine, but there are fewer people writing for the Dragon these days and if you want a particular modem you might have to go elsewhere for the software to drive it. There are two different levels generally available. The first is somewhat basic which is not to say that it isn't very useful. It would normally consist of two or more programs. Firstly there would be a Viewdata system this would give you all the Viewdata graphics and text on a forty column screen. All messages would have to be entered via the keyboard while on line

and to save messages you have to leave to save the whole screen is used. The Atari program for bulletin boards would operate on the standard 32 [illegible] can mean some very rapid scrolling [illegible] boards operate on a 40 by 24. The [illegible] with is that each line on the board will be only two lines on the screen. All incoming data can be stored in a buffer and saved to disc or tape at regular intervals. This is sort of software you would expect to find bundled with your modem and is best described as adequate.

At the other end of the scale there is the system that only runs under Flex or OS-9 and supports auto dial, allows you to prepare messages before going on-line and allows incoming data to be diverted to the disc drive to be read later. With this system you even get a 51 x 24 display on the Ascii program. However the price does tend to put you off somewhat. The real tragedy is there does not seem to be anything in between. A system that would run under *BASIC42* or *Edit+* for instance. The only advice I can give is get the best you can afford.

There is [illegible] that is certainly no myth namely that [illegible] can get you a whole lot of trouble, especially if you are not the one that pays the phone bill. The last thing that you want is to come home and find all your equipment has been sold to settle up with BT. So study your phone book, make note of all the codes marked L and use those in preference to others. Also check all those with a charge code e or bl, these are your reserves. Keep the time down and you should be okay. Any code with a charge code b is going to cost you about a pound for 10 minutes during on off peak period. If the board you use has a cost so far facility then use it frequently and keep a rate of liter run high totals over the weeks.

Well I hope this has helped any of you contemplating going on-line and so that once you have got your modem you will also have someone to call I have included some useful numbers. One last thing to mention before I go is that most of the people that operate bulletin boards have invested a lot of money and time on their system. They invariably get nothing out of it save the satisfaction of helping the rest of us. So before you log off leave a message for the sysop to tell him what you think of this board. It might make his day.

Below I have listed some numbers you might find useful.

6809 Board 1200/75 01-316-7402 24hrs
Walley 300/300 0909-773564 Sat Thu 2100 0500
BSS09 300/300 1200/75 0705-736025
0705-736025
DBBS 300/300 0376-518818 24hrs
TUG 11 300/300 1200/75 021-444-1484

All these boards have Dragon sections. A list of boards can be found on two Distel boards 01-679 1688 for 300/300 and 01-679-6183 for 1200/75.

You can contact me at MB207 on the 6809 board or leave a message on 0227 276162.

Crossword

The second great month of the Dragon Crossword. We have no reports of your verbal veracity yet, because despite the legend (now you know why it is called a legend) on the front cover it is still November here in Little Newport Street, none of you have seen the crossword and only the practising telepaths have replied.

Don't forget that there will be a couple of free tapes from the Editor's Magic Bottomless Box for the first correct entries to reach us each month. You can even try telling us which tapes you'd like in an ideal world. No promises. It all depends on what we have in stock.

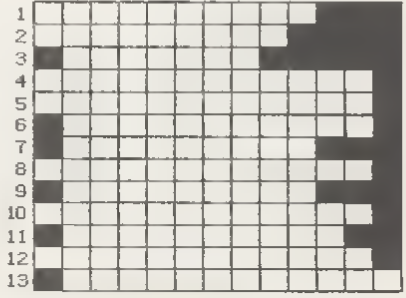
And you don't have to cut up your *Dragon User* either — heaven forbid! Entries can be written out on a photostat or a plain piece of paper as long as we can read 'em.

And no tie-breakers!

1. Put your jewellery into fortifications! (3,7)
2. Bird in Lincoln Green? (5,4)
3. Dirty things in dumps (7)
4. Is the Enterprise one? (5,7)
5. Her young cheri told you he's starving (6,6)
6. Does it fight its bellies on the underground? (7,4)
7. A sign of two pawnbrokers plus two (9)
8. Did Van Gogh become one? (5,7)
9. Nigel and Alain are both in it (5,4)
10. Gender and rag ran a risky job in Yellowstone Park! (6,6)
11. Nose to cram into tuner rise (4,6)
12. Attack on Satan? (5,7)
13. Rock spot hero alarms a soldier! (5,7)

by Terry and Derek Probyn

All this month's answers are names of Dragon software. When the crossword is complete, the column marked with an arrow will spell out a phrase.



Pamcodes

Pam D'Arcy continues her introduction to machine codes

I trust that no difficulties were encountered in displaying your name in the top left position of the screen. My own program is shown in **listing one**.

I wonder if any readers thought why not poke the name direct to the text screen area (fixed at $400-$5FF on the Dragon) using LDA/STA instructions? Using the output character ROM call $B00C has many benefits in that it carries out some functions that would otherwise need to be performed within our programs. For instance if you poked a 'P' directly into the top left screen location ($400)

```
LDA # P
STA $400
RTS
```

– in Basic, POKE&H400,ASC("P") a capital P would appear. However only the @ symbol, capital letters and a few other shift+characters retain their original values (decimal ASC values or character codes 64-95) when being displayed. All other characters have adjustments made to their values to match the needs of the hardware display chips in the machine. I didn't use lower case characters in the display of my name for cleverness, but to make this point! Poking a lower case character into the top left of the screen does not result in the reversed screen (green on black) of character e

```
CLS (else the result may be scrolled off the
   top by the OK display after the POKE
   command)
POKE &H400,ASC('e')
```

(quick memory jogger for those who need it — lower case — reverse screen — letters are obtained from the keyboard by holding down shift and pressing zero after typing in required reversed characters, repeat shift+0 to return to normal display mode)

If the result is 1, what does POKE&H401,ASC('1') give? The technical reasons for this are discussed in the book *Inside the Dragon* page 159. As well as carrying out such character code conversions $B00C acts as appropriate when it receives an end of line or carriage return ($0D) character — that is clears the rest of the line to spaces and sets the next print position to the start of the next line. It also takes care of scrolling the text screen up one line if the last screen position is being used ($5FF).

Keyboard Input

Most programs will not be using fixed data as above but will be dealing with information held on a file or being input from the keyboard. We can then substitute printing the fixed characters of a name by printing name (and other) data as it is input from the keyboard. The program needs to be able to determine when input is complete, so that it can return to Basic so you can choose what condition determines that for you. For example, I shall use a press of the ENTER key.

As with displaying a character on the text screen there is a ROM routine that can be used to obtain keypresses. This is at address $B006. It puts the ASC (henceforth ascii) value of the keypress in register A. If there was no keypress register A will be set to null ($00). **Listing two** clears screen and prints keypresses until ENTER is pressed. I shall be dealing with branch instructions (BEQ/BNE) in a moment.

Line 30 causes a jump back to the get a character ROM call if there was no keypress. This forms a 'loop' of code that is repeated ad nauseum until the exit condition is met (in this instance, a key is pressed). Line 40 prints the keypress if it is a printable value (for example left arrow still deletes a character; break is ignored etc). Line 50 checks for the terminating condition — CoMPare the contents of register A with the actual ascii value for the carriage return instruction at label GETKEY (Branch Not Equal). This is a further loop of code that continues until its exit condition is met (enter key pressed).

If there is a program error preventing the exit condition being met (for example above comparing the keypress with a value that can be input) the program simply sits there looping away round the code — it never gets tired! The break key panic button of Basic programs is ineffective in machine code — we are on our own — so tight loops can only be broken by pressing the RESET button.

Unique labelling

In Basic programs GOTOs and GOSUBs always jump to a unique location — the line number — which cannot obviously be duplicated in a program (the Basic editor overwrites the original line on any subsequent input of the same line number). Assembly source uses our own label names for moving around programs. Label names must be unique or the program will not know which location to use; duplicate names are usually detected at the assembly stage, but the error message may not be very clever — the likes of 'phasing error' or 'redefined symbol' (label names are usually referred to as symbols in assemblers) are often caused by accidentally duplicating a name in the label column.

The next screen position maintained by

Listing 1

EXPECTED GENERATED OBJECT CODE	LINE NUMBER	LABEL	SOURCE CODE MNEMONIC	OPERAND
BD BA 77	10	GO	JSR	$BA77
86 50	20		LDA	#'P
BD B0 0C	30		JSR	$B00C
86 61	40		LDA	#'a
BD B0 0C	50		JSR	$B00C
86 6D	60		LDA	#'m
BD B0 0C	70		JSR	$B00C
39	80		RTS	
	90			

Listing 2

EXPECTED GENERATED OBJECT CODE	LINE NUMBER	LABEL	SOURCE CODE MNEMONIC	OPERAND
BD BA 77	10	GO	JSR	$BA77
BD B0 06	20	GETKEY	JSR	$B006
27 FB	30		BEQ	GETKEY
BD B0 0C	40		JSR	$B00C
81 0D	50		CMPA	#$0D
26 FA	60		BNA	GETKEY
39	70		RTS	
	80			

the Rom routine [illegible] known as a text screen pointer. It holds the next cursor address and is held in two bytes at address $88,$89. The co-ordinates pointer is another address — the first text screen address to be used for display. When the screen is cleared (CLS) the contents of this pointer is reset to the first address of the text screen ($400). When the text screen has been scrolled up one line the content of the pointer is reset to contain the address of the start of the last line of the screen $5E0. Receipt of carriage return characters causes it to be set to the address of the start of the next line subject to a scroll condition being encountered. Unless any of these special cases are met display of a character causes the address in the text screen pointer to be incremented by 1. Unlike the graphics display even in machine code the position of the text screen is fixed at $400 $5FF.

To display text at a specific point on the text screen (Basic PRINT@ statement) the appropriate address can be calculated and stored in the text pointer prior to calling the ROM routine $800C. There is one small position per byte so the @ value should be added to the text screen start address, e.g. PRINT@256 is $400+256, or $400+$100 so to print a name as input @256 could appear as in **listing three**.

What $800C does not do is check that the content of the pointer is between $400-$5FF before it displays the next character (why would it cross check something that it is in charge of?). As in all machine code (or Basic POKE) manipulation of Basic's workspace locations [illegible] it presents [illegible] expecting everything is [illegible] so weird results may occur if we [illegible] of line — it cannot distinguish between accidental or deliberate sabotage! As I have said we are on our own in machine code. This also allows us to cheat the system when it suits us!

Branching out

The condition code register (CCR) was mentioned in the last issue as being one of the single byte registers on the Dragon. Each of the eight bits has a specific task and the execution or otherwise of a branch instruction depends upon current setting of one or more of these bits or flags at that moment. Some instructions affect some of these flags, others none. In general we should be able to manage without gory detail.

As with the instructions in general some are used much more frequently than others — and others almost never. It really does depend upon the nature of the program. A common problem with branch instructions is using a signed branch when an unsigned one should have been used — discussed in a moment. One of my greatest programming aids is having copied out table one onto a postcard for instant access.

There are also BEQ (Branch on EQual) and BNE (Branch Not Equal) that act independently of signed/unsigned conditions. BEQ is also a branch if zero instruction with BNE its complement: branch if not zero.

TABLE OF BRANCH INSTRUCTIONS

SIGNED	UNSIGNED	EQUIVALENT
BGE	BHS/BCC/(BPL)	
BGT	BHI	
BLE	BLS	
BLT	BLO/BCS/(BMI)	
BVC		
BVS		

You can probably tell determine the conditions of many of the above branch instructions — Greater/Equal Greater Than Less/Equal Less Than. The V instructions are the less frequent oVerflow Clear/oVerflow Set — they probably won't be dealt with except in passing at the end of the series. On the unsigned side are High/Same Carry Clear, PLus, High, Lower/Same, LOwer Carry Set, Minus. The BPL and BMI instructions are shown in brackets as there are certain conditions when they will give a false condition because of OVERFLOW intervening. Generally after arithmetic on signed numbers use their equivalent signed comparison instructions.

Also in the branch range are BRA (BRanch Always), BRN (BRanch Never — of little practical use — it maintains the symmetry of the instruction set — all the branch instructions have complementary pairings — BLT/BGE etc. BSR (Branch to SubRoutine) completes the branch instructions.

The branch instructions including BSR generate position independent code — that is it you take the source code that we have been using so far in this series apart from the likes of ROM calls be going to a fixed position, the same saved object code will work whether reloaded at, say $5001 or $6600 or $EABC (the latter for Dragon 64 users who have mapped ROM to RAM while retaining 32K mode). This is because our goto instructions have all been of the position independent nature of the branch instructions as opposed to JuMP. Unlike some machines there are no conditional JuMP instructions on the Dragon (but we do have goodies that other machines haven't got) so for illustrative purposes I shall adjust the second loop exit code of the above as in **listing four**.

If the object code is saved (CSAVEM NAME, &H5001,&H5001) and loaded some time in the future at its default address (address the code was saved from) and is executed it will run correctly. However if it is loaded elsewhere in the machine unless the first keypress is <enter> the instruction in line 65 JMP GETKET is of the extended mode (=actual address) type discussed in last month's article and the address generated within the object code $5009 will be branched to REGARDLESS OF THE PROGRAM'S CURRENT LOAD ADDRESS, leading to potential disaster.

The branch instructions are so useful as they generate code that says branch to the instruction at + or — a number of bytes from this instruction. Some assemblers permit

Continued on page 24

Listing 3

EXPECTED GENERATED OBJECT CODE	LINE NUMBER	LABEL	SOURCE CODE MNEMONIC	OPERAND
BD BA 77	10	GO	JSR	$BA77
CC 05 00	14		LDD	#$500
DD 88	17		STD	$88
BD 80 06	20	GETKEY	JSR	$8006
27 FB	30		BEQ	GETKEY
BD 80 0C	40		JSR	$800C
81 0D	50		CMPA	#$0D
26 FA	60		BNE	GETKEY
39	70		RTS	
	80			

Listing 4

OBJECT ADDRESS $	EXPECTED GENERATED OBJECT CODE	LINE NUMBER	LABEL	SOURCE CODE MNEMONIC	OPERAND
5001	BD BA 77	10	GO	JSR	$BA77
5004	CC 05 00	14		LDD	#$500
5007	DD 88	17		STD	$88
5009	BD 80 06	20	GETKEY	JSR	$8006
500C	27 FB	30		BEQ	GETKEY
500E	BD 80 0C	40		JSR	$800C
5011	81 0D	50		CMPA	#$0D
5013	27 03	60		BEQ	STOP
5015	7E 50 09	65		JMP	GETKEY
5018	39	70	STOP	RTS	
5019		80			

Music extender

***David Makin** presents an upgrade on his program Music Maker*

FIRST of all a couple of tips for using *Music Maker*

1. When using the Alter a perticular note option middle C has a numerical value of 52, C an octave higher 64 and C an octave lower 40.

2. For those of you with the DOS you can run *Music Maker* with the DOS attached by loading it using POKE&HBC,6 CLOADM instead of just CLOADM

Of course now that *Music Maker* has been out for a while, I have found several ways of improving the machine code tunes it produces which are

1 Storing the tune data in an improved form resulting in a large memory saving (typically more than 60%)

2 Allowing several tunes to be put in the same program

3 Using different sample waveforms on each channel allowing a variety of different tones which may be altered for different tunes

The listings give a total of six programs incorporated respectively in listings 1 2 and 3 4 5 and 6 7 8 and 9. First type in and save the three machine code source programs listings 2 or 3 5 or 6 and 8 or 9 Note those of you using DASM replace) with and vice-versa in the assembler source code

Next type in and save 1 CONVRTER and then load and run 3 or assemble 2 and use CSAVEM SHRINKIT &H4000 &H4333 &H4000 to save the resultant m/c after "CONVERTER" Then type in and save 4 BUILDBOX either after SHRINKIT' or on another tape Then load and run 8 or assemble 5 and use

FOR I=0TO255 V=32+31.5*SIN(3.14159*I/126) FOR J=&H7C00 TO &H7F00 STEP256 POKE I+J,V NEXT J I then CSAVEM "JUKEBOX",&H7800,&H7FFF,&H7A17 after BUILDBOX"

Then type in and save 7 'MIXER either after 'JUKEBOX' or on another tape Then load and run 9 or assemble 8 and use

CSAVEM "WAVEMIX",&H2600,&H2755,&H2642

after 'MIXER" The programs are written to work with or without a DOS attached, but do not use the disc. If you wish to run them from disc you must alter the the relevent load and save routines and PEEK eddresses in the Basic programs

Use the programs as follows

1 CONVRTER/SHRINKIT load and run CONVRTER then as instructed position the tape to load the *Music Maker* tune file for convertion (EG "IMNTSMGD") then use the same play-shifts as you would to play the tune on *Music Maker* itself. Then go and have a cup of coffee while the tune is coverted (or in the case of longer tunes grow the beans!) as the convertion may take up to two hours (1.5 in the case of HGRNMRCH a few minutes for IMNTSMGD") When the conversion is done always make a note of the four values given then save the converted tune to tape

2 BUILDBOX/JUKEBOX load and run BUILDBOX then for each tune you wish to add to the jukebox type in the four values position the tape and load the tune When finished loading tunes position the tape and save the finished jukebox — you can put up to 32 tunes on each! Note to add to a jukebox that already has some tunes on it, position the tape at its start before RUNning "BUILDBOX'

3. MIXER/WAVEMIX load and run "MIXER' then after "WAVEMIX" has loaded position the tape to load the copy of 'JUKEBOX" which you wish to alter (it must have at least 1 tune on it) Then use the menu to build new waves using different porportions of the base waves and try using the built waves on different channels for different tunes Note pressing the space bar to return from viewing waves using option 2 does a PCLS before returning whereas any other key doesn't allowing you to compare different waveforms Also using square, sawtooth or the higher harmonics for higher notes isn't recommended (see *Rainbow* Dec 1983)

Remember to CLEAR memory to below any 'JUKEBOX' before loading it 'JUKEBOX' programs make no ROM calls and are relocatable in units of 256 bytes (subject to corrupting the stack etc) eg CLOADM "",65536-1536 (the m/c tunes saved from *Music Maker* are also relocatable by units of 256)

For those of you who find the task of typing in the programs yourself too daunting and can't find a sufficient mug to do it for you the programs are available from John Penn for £2.50 including a version for disc a ready built jukebox of 30 tunes (each once only it plays for one hours and nine minutes) and a copy of the m/c screen dump which I wrote for my latest release from John Penn *Picture Maker*

Listing 1 — The Converter Program

```
0 PCLEAR4:CLEAR200,&H3FFF:DIM S(3),E(3),N$(3),NE(3):CLOAD"SHRINKIT"
1 CLS:PRINT'POSITION THE TAPE FOR LOADING  THE NEXT TUNE ":MOTORON AUDIOON
2 INPUT'FILENAME ";F$:MOTOROFF AUDIOOFF:IFLEN(F$)>8THENDIELSECLOSE'OPEN'I',#-1,F$
  INPUT#-1,F$:PRINT'LOADING "F$"':" FOR I=1TO5:INPUT#-1,T NEXT:FOR I=1TO3:INPUT#-1
,T NEXT:CLOSE
3 FOR I=0TO3:A$="CH"+STR$(I):CLOADM"":S(I)=PEEK(148*I+254)+PEEK(148*I+149):E(I)=PEEK(126+
I*254+PEEK(127+I):I=PRINT'PLAYSHIFT FOR CHANNEL'I+1:INPUT#-1,F:IF F<0 THENFOR J=S(I)+1TOE(
I):STEP2:W=PEEK(J):POKE2,W:POKE1,W:NEXTJ
4 NEXT:SKIPF#0:PRINT'CONVERTING THE DATA  ':A=PEEK(&H3C1A)+256:FOR I=0TO3:N$(I)=
A$:L=0:FOR I=S(I)+1TOE(I):STEP2:IF PEEK(I)=0THENNEXTI ELSEN=PEEK(I):POKE&H3C1A,&H3C:POKE&
H3C1B,N:POKE&H3C1A,A:T=0:A=A+3
5 FOR I=0(2)TOE(I):STEP2:V=&H80:IFPEEK(I+1)=0THENV=V+&H7C:GOTOBELSEO PEEK(I+1):N=N
=N+0:IFO<15ORO>14THENPOKE&H3C1B,N:POKE&H3C1A,A:N=0:O=0:POKE&H3C1B,T:A=A+3
6 IFO>OTHENV=V+4ELSEO=ABS(O)
7 V=V+D*8
8 IFL=PEEK(I+1)THENPOKE&H3C1B,V:A=A+1ELSEL=PEEK(I+1):V=V+2:POKE&H3C1B,V:POKE&H3C1A,L:A=A+2
9 NEXTI:NE(I)=A:NEXTJ:PRINT'CONVERSION DONE - REPEATS NOW  BEING FOUND AND INSERTED ":&H4334:FOR I=0TO3:H=INT(INSTR(1,"256",L=N$(I)+"256"):H$=CHR$(H):L$=CHR$(L):Z=E(I)-S(I)+1:POKE&H3C1B,H$:Z=Z+1:POKE&H3C1B,L$:Z=Z+1
10 H=INT(NE(I)/256):L=NE(I)-256*H:POKE&H3C1B,H$:Z=Z+1:POKE&H3C1B,L$:Z=Z+1:NEXT:EXECM4000:CLS:FOR I=0TO3:S(I)=PEEK(I+&H254+PEEK(I+1)):E(I)=PEEK(I+2)+256+PEEK(I+3):I=I+4:NEXT:FOR I=0TO3:PRINT'VALUE';I+1;"=";E(I):NEXT
11 PRINT'MAKE A NOTE OF THE ABOVE AND":PRINT'POSITION THE TAPE FOR SAVING THECONVERTED TUNE THEN PRESS ENTER' NOTORON AUDIOON:INPUT A$:PRINT'PRESS  S' TO SAVE THE TUNE":MOTOROFF:AUDIOOFF
12 IFINKEY$<>"S"THENIELSEPRINT'SAVING "";F$;"":CSAVEM#,S(0),E(3)+1,4111:PRINT'
13 DO YOU WISH TO CONVERT ANY MORE TUNES (Y/N) ?"
14 A$=INKEY$:IFA$<>"Y"THENIELSEIFA$="N"THENENDELSE13
```

Listing 2

```
4000                        ORG     $4000
4000 4F             1   $1APT   CLRA
4001 B7 4B5A        2           STA     A
4004 B7 4270        3           STA     I
4007 8E 0080        4   LLOOP   LDX     #80
400A 9E 41B3        5           STX     B
400D C6 04          6           LDB     #4
400F 3D             7           MUL
4010 8E 4334        8           LDX     #SCNTBL
4013 30 88          9           LEAX    B,X
4015 10AE 81       10           LDY     ,X++
4018 10BF 406B     11           STY     I
401C EC 84         12           LDD     ,X
401E FB 4073       13           STB     ENDSC
4021 B3 0007       14           SUBD    #7
4024 FD 4269       15           STD     ICMP
4027 CE 0006       16   TLOOP   LDU     #6
402A FF 4141       17           STU     C
402D 9E 4334       18           LDX     #CNTBL
4030 9E 4DCB       19           STX     P
4033 10BE 4243     20           LDY     #CMP
4037 7F 424A       21           CLR     RF
403A A6 4B5A       22   RLOOP   LDA     A
403D 27 1E         23           BEQ     RPT1
403F 4F            24           CLRA
4040 CE 4354       25           LDU     #RPTBL
4043 AC C4         26   LLOOP   CMPX    ,U
4045 23 16         27           BLS     NPT1
4047 AC 42         28           CMPX    2,U
4049 24 0B         29           BHS     #EXTL
404B EC 42         30           LDD     2,U
404D B3 00A1       31           SUBD    #1
4050 FD 40CB       32           STD     P
4053 16 01E4       33           LBRA    NEXTP
4056 33 49         34   NEXTL   LEAU    4,U
4058 4C            35           INCA
4059 81 08         36           CMPA    #8
405A 25 E6         37   A       EBO     *-1
405C CC 0000       38           LDQ     #0
405F FB 413B       39   RPT1    STB     LL
4062 FB 4092       40           STB     B
4065 10BE 406B     41           LDY     J
4069 8C 0008       42   LLOP1   CMPX    #8
406C 1024 00CB     43           LBHS    ENDL
4070 109C 0000     44   1       EBQ     *-2
4073               45   ENDSC   EBQ     *-2
4075 1024 00C3     46           LBHS    ENDL
4079 A6 80         47           LDA     ,X+
407B A1 A8         48           CMPA    ,Y+
407D 1026 0006     49           LBNE    ENDL
4081 CC 0000       50           LDD     #0
4084               51   B       EBQ     *-2
4084 C3 0001       52           ADDD    #1
4087 FE 4B82       53           STU     B
408A B6 4B5A       54           LDA     A
408D 27 14         55           BEQ     RPT2
408F 4F            56           CLRA
4090 CE 4354       57           LDU     #EATBL
4093 AC C4         58   MLOCA   CMPX    ,U
4095 23 0C         59           BLS     RPT2
4097 AC 42         60           CMPX    2,U
4099 25 CF         61           BLO     LLOP1
409B 33 49         62   NEXTB   LEAU    9,U
409D 4C            63           INCA
409E B1 4B5A       64           CMPA    A
40A1 25 F8         65           BLO     MLOCP
40A3 B6 01         66   RPT2    LDA     #1
40A5 B7 40E3       67           STA     E
40A8 FC 4B6B       68           LDD     J
40AB FD 4BC4       69           STD     F
40AE FC 4BC4       70   LOOP2   LDD     F
40B1 F3 4082       71           ADDD    B
40B4 FD 40C4       72           STD     F
40B7 F3 4082       73           ADDD    B
40BA 10B3 4073     74           CMPD    ENDSC
40BE 22 2E         75           BHI     END2
40C0 CC 0000       76           LDD     #0
40C3 CE 0080       77   LOOP3   LDU     #80
40C6               78   F       EBQ     *-2
40C6 33 CB         79           LEAU    B,U
40C8 34 16         80           PSHS    B,X
40CA BE 0000       81           LDX     #0
40CD               82   P       EBQ     * 2
40CD 30 88         83           LEAX    B,X
40CF A6 C4         84           LDA     ,U
40D1 A1 84         85           CMPA    ,X
40D3 3B 16         86           PULS    B,X
40D5 26 17         87           BNE     END2
40D7 C3 0001       88           ADDD    #1
40DA 10B3 4002     89           CMPD    B
40DE 25 E3         90           BLO     LOOP3
40E0 34 02         91           PSHS    A
40E2 86 B0         92           LDA     #6
40E3               93   E       EBQ     * 1
40E4 4C            94           INCA
40E5 B7 40E3       95           STA     E
40E8 81 FF         96           CMPA    #255
40EA 35 82         97           PULS    A
40EC 25 CE        98           BLO     LOOP2
40EE 86 4082      99   END2    LDA     B
40F1 F6 40E3      100           LDB     E
40F4 3D           101           MUL
40F5 1E B6        102           EXG     A,E
40F7 34 0A        103           PSHS    B
40F9 86 4083      104           LDA     B+1
40FC FA 40E3      105           LDB     E
40FF 3D           106           MUL
4100 E3 E1        107           ADDB    S++
4102 CE 0080      108           LDU     #B
4103              109   B       EBU     #-2
4105 27 1B        110           BEQ     CHKTL
4107 34 BA        111           PSHS    D
4109 CE 4354      112           LDU     #RPTBL
410C B6 4B5A      113           LDA     A
410F 4A           114           DECA
4110 CA B9        115           LDB     #9
4112 3F           116           MUL
4113 33 CB        117           LEAU    B,U
4115 EC 42        118           LDD     2,U
4117 A3 C4        119           SUBD    ,U
4119 10A3 E4      120           CMPD    ,S
411C 35 B6        121           AULS    D
411E 1024 FF4B    122           LBHS    LOOP1
4122 1083 4138    123   CHKIL   CMPU    TL
4126 1023 FF40    124           LBLS    LOOP1
412A FB 4139      125           STB     TL
412D B6 4BE3      126           LDA     E
4130 B7 422F      127           STA     E1
4133 FC 4B0B      128           LDD     G
4136 FD 422A      129           STD     #1
4139 16 FF2E      130           LBRA    LOOP1
413C CC 0000      131   ENDL    LDD     #0
413F              132   TL      EBU     #-2
413F 1083 0000    133           CMPD    #0
4143              134   C       EBU     #-2
4143 1023 00F3    135           LBLS    NEXTK
4147 8E 4141      136           LDX     C
414A 8C 0007      137           CMPX    #7
414D 29 03        138           BLD     CHKB
414F 7A 4B5A      139           DEC     A
4152 8E 41B3      140   CHKB    LDX     B
4155 1027 0EA0    141           LBEB    READ&T
4159 8E 0B00      142           LDX     #8
415C 8E 41B3      143           STX     B
415F 8E 4354      144           LDX     #RPTBL
4162 86 4B5A      145           LDA     A
4165 4A           146           DECA
4166 CA 09        147           LDB     #9
4168 3D           148           MUL
4169 30 8B        149           LEAX    B,X
416B A6 08        150   LINE6   LDA     B,X
416D 4A           151           DECA
416E 27 0A        152           BEB     #IMBLE
4170 A7 00        153           STA     B,Y
4172 EC B2        154           LDD     2,X
4174 A3 06        155           SUBD    6,X
4176 E3 0A        156           ADDD    4,X
4178 2B 0C        157           BMI     LIME7
417A EC 06        158   #IMBLE  LDD     6,X
417C A3 02        159           SUB6    2,X
417E F3 406B      160           ADDB    J
4181 E0 06        161           STB     6,X
4183 FC 4B6B      162           LDD     J
4186 ED 02        163   LIME7   STD     2,X
4188 10B3 4B6B    164           CMPD    J
418C 22 3B        165           BHI     LINE6
418E A3 84        166           SUBD    ,X
4190 10B3 0007    167           CMPD    #7
4194 25 A8        168           BLS     BELEIE
4196 8E 41F8      169           LDX     #PTPT2
4199 CE 4354      170           LDU     #RPTBL
419C EC 06        171   RPTB    LDD     6,X
419E 11A3 C4      172           CMAB    ,U
41A1 23 51        173           BLS     RPT9
41A3 10A3 42      174           CMPD    2,U
41A6 24 4C        175           BHS     PAT9
41A8 86 01        176           LDA     #1
41AA A7 0A        177   RT6     STA     8,X
41AC EC C4        178           LDD     ,U
41AE A3 84        179           SUBD    4,X
41B0 34 06        180           PSHS    B
41B2 EC 86        181           LDD     A,X
41B4 A3 C4        182           SUBD    ,U
41B6 10A3 E1      183           CMPD    S++
41BA 22 12        184           BHI     NPL1B
41BC EC C4        185           LDD     ,U
41BE EB E6        186           STB     4,X
41C0 A3 84        187           SUBB    4,X
41C2 10B3 0007    188   RPT11   CMPD    #7
41C6 25 37        189           BLO     DELETE
41C8 E3 84        190           ADD     #800   ,X
41CA ED B2        191           STD     2,X
41CC 20 34        192           BRA     AEFEA1
41CE 34 06        193   RPL10   PSHS    B
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Listing 2 continued

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41CF   CC C4          196          LDD   #$C4
41D1   A3 04          197          SUBD  4,X
41D3   C3 04          198          ADDD  4,X
41D5   FA 04          199          ORB   4,X
41D   CC 4A           200          LDD   #$4A
41D   4  44           201          SUBD  4,U
41D   A  E4           202          CMPA  ,S
41DC   24 08          203          BHS   PP1
41E0   32 62          204          LEAS  2,S
41E2   EC 44          205          LDD   4,U
41C4   A1 46          206          CMPA  6,U
41C6   34 06          207          PSHS  D
41C8   CC 84          208  PP115   LDD   #$84
41CA   ED 04          209          STD   4,X
41CC   E3 C4          210          ADDD  ,U
41CE   ED 04          211          STD   4,X
41D0   33 06          212          PULS  D
41D2   20 CB          213          BRA   RPT11
41D4   33 48          214  PP19    LEAU  8,U
41D6 1183 8000        215          CMPU  #$0
41D   26 A8           216  RPTPS2   BNE   *-2
41DA   25 A8          217          BLO   RPT*
41DC   20 03          218          BRA   REREAT
41DE   7A 405A        219  DELETC   DEC   A
41E1   FC 413E        220  REPCAT   LDD   TL
4204   FF 4141        221          STU   C
4207   8E 4354        222          LDX   #MPTBL
420A   F6 405A        223          LDB   A
420D   B4 C8          224          LDA   #A9
420F   38             225          MUL
4210   30 8B          226          LEAX  $*X
4212   FC 406B        227          LDD   J
4215   ED 81          228          STD   X++
4212   F3 4141        229          ADDD  C
421A   C8 01          230          STD   X++
421C   34 0A          231          PSHS  D
421E   FC 406B        232          LDD   K
4221   ED B1          233          STD   ,X++
4223   C3 8050        234          ADDD  #$0
4224                  235  B1      DBU   $ 2
4226   ED 81          236          STD   X++
4228   8B 0E          237          LDD   #$0E
422B                  238  C1      EBU   #-1
422A   A2 84          239          STA   X
422C   B7 4244        240          STA   AF
422F   7C 405A        241          INC   A
4232   35 06          242          PULS  D
4234 1083 4269        243          CMPD  JCMP
4238   22 35          244          BHI   NEXTF
423A   BE 40C0        245  NEXTK   LDX   M
423B   30 01          246          LEAX  1,Y
423F   BF 40CB        247          STX   M
4242   8C 0800        248          CMPX  #$0
4243                  249  KCMP    EBU   #-2
4245 1025 FBF1        250          LBLO  KLOOP
4249   46 8B          251          LDB   #$0
424A                  252  NE      DBU   #-1
4248   27 B4          253          BEB   SNB
424B   BE 4141        254          LDX   C
4250   BF 4103        255          STX   B
4253   BE 4103        256  SNB     LDX   B
4256   22 85          257          BEB   NEXTJ
4258   30 1F          258          LEAX  -1,X
425A   BF 4103        259          STX   B
425B 108F 4068        260  NEXTJ   LDY   J
4261   31 21          261          LEAY  1,Y
4263 108F 4068        262          STY   J
4267 108C 0080        263          CMPY  #$0
4269                  264  JCMP    EBU   #-2
426B 1025 FB8B        265          LBLO  JLOOP
426F   84 00          266  NEXT1   LDA   #$0
4271                  267  1       DBU   #-1
4271   4C             268          INCA
4272   B7 4270        269          STA   I
4275   81 84          270          CMPA  #$4
4277 1025 FB8C        271          LBLO  JLOOP
427B   8E 4334        272          LDX   #SCNTBL
427E   CE 84          273          LDU   ,X
4280   FF 429A        274          STU   O
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4283   6C 8E          275          INC   $-9
4285   F8 4324        276          LDB   14,X
4288   5F             277          STB   BONE
4287   FF 4316        278          CLRB
428C   F7 42C0        279          STU   N
428F   8E 4354        280          STB   Y
4292   BF 42C7        281          LDX   #MPTBL
4295   4F             282  L1      STX   MPTPOS
4296   8E 4334        283          CLRA
4299   CE 0000        284          LDX   #SCNTBL
429A                  285  0       LDU   #0
429C 11A3 84          286  L2      EBU   #-2
429F   26 09          287          CMPU  ,X
42A1   FE 4316        288          BNE   L3
42A4   EF 8810        289          LDU   M
42A7   FE 428A        290          STU   +16,X
42AA 11A3 02          291  L3      LDU   0
42AE   26 09          292          CMPU  2,X
42AF   FE 4316        293          BNE   L4
42B2   EF 8812        294          LDU   N
42B5   FC A29A        295          STU   +18,X
42B8   4C             296  L4      LDU   0
42B9   30 04          297          INCA
42BB   81 0A          298          LEAX  4,X
42BD   25 E8          299          CMPA  $4
42BF   8A 00          300          BLO   L2
                      301  X       LDA   #0-1
42C1   B1 405A        302          CMPA  A
42C4   24 4F          303          BHS   L9
42C6   8E 0B00        304          LDX   B8
42C2                  305  APTPOS   EBU   # 2
42CB 11A3 D4          306  L5      CMPU  4,X
42CC   26 B2          307          BNE   L6
42CE   FE 431A        308          LDU   8
42D1   EF D4          309          STU   4,X
42D3   20 0A          310          BRA   L7
42D5 11A3 B8          311  L6      CMPU  -8,X
42D8   2B 00          312          BNE   L0
42DA   FC 431B        313          LDU   8
42DD   EF D6          314          STU   8-X
42DF   FE 429A        315  L7      LDU   0
42E2   4C             316  L0      INCA
42E3   30 B9          317          LEAX  -7,X
42E5   B1 405A        318          CMPA  A
42E8   25 BF          319          BLO   L5
42EA   8C 42C2        320          LDX   #PTPOS
42ED 11A3 B4          321          CMPU  ,Y
42F0   2B 23          322          BNE   L9
42F2   FE 431B        323          LDU   8
42F5   4F             324          CLRA
42FA   C6 08          325          LDB   -8,U++
42F8   E8 C1          326          TFR   U,B
42FA   1F 30          327          SUBB  4,X
42FC   A3 04          328          STB   U++
42FC   E0 C1          329          TFR   U,B
4300   1F 30          330          SUBB  4,X
4302   A3 06          331          STB   ,U++
4304   E8 C1          332          STU   N
4306   FF 431A        333          LDU   2,X
4309   EE 02          334          LEAX  -8,X
430B   30 98          335          STX   MPTPOS
430D   8F 42C7        336          INC   X
4310   7C 42C0        337          LDA   L10
4313   20 0A          338  L9      LDX   A0
4315   8E 0000        339  N       EBU   # 2
4316                  340          LDA   U+
4318   A6 C0          341          STA   ,X+
431A   A7 80          342          STX   N
431C   BF 4316        343          LDU   0
431F   FF 429A        344  L10     STU   O
4322 1183 0800        345          CMPU  A0
4324                  346  BONE    DBU   # 2
4326 1025 FF6B        347          LBLO  L1
432A   FC 431A        348          LDB   8
4328   8E 4334        349          LDX   #SCNTBL
4330   E8 00IC        350          STB   38,Y
4333   39             351          RTS
4334                  352  SCNTBL   RMB   32
4354                  353  MPTBL    EBU   9
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A       =405A    B       =4103    C       =4141    CHK0    =4152    CHKTL   =4122
D       =40B2    B1      =4224    DELETE  =41FE    DONE    =4324    E       =40E3
E1      =4229    END1    =413C    END2    =40EE    EMESC   =4023    F       =4DC4
I       =4270    JLOOP   =4067    J       =406B    JCMP    =426B    JLOOP   =4027
K       =40CB    KCMP    =4243    KLOOP   =403A    L1      =4295    L10     =431F
L2      =429C    L3      =42AA    L4      =42BB    L5      =42C9    L6      =4295
L7      =42BF    L8      =42E2    L9      =4315    LINE6   =4168    LINE7   =418A
LLDBP   =4043    LOOP1   =40AE    LOOP2   =40AE    LOOPJ   =40C3    MLOOP   =4093
N       =4316    NEXT1   =424F    NEXTJ   =425B    NEXTK   =423A    NEXTL   =4054
NEXTM   =409B    O       429A     AEPEAT=4201      MF      =424A    RPT1    =405B
RPT10   41C8     RPT11   =41C1    RPTEL   4354     RPTPOS=42C7      RPT2    =4083    RPT8    =419C
RPT9    41F1     RPTBL   4354     SB0     4253     RPTPS2=41F0      SCNTBL=4334
SINGLE  412A                      START   =4000    TL      =413B    X       =42CB
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Listing 3 — Basic Source Update

```
0 CLEAR200,&H3FFF:L=2:FOR1=&H4000 TO&H4333 STEP29 C=0 FOR J=T TO1+19 READ&0 A=VAL
("&H"+A$):C=C+A:POKEJ,A NEXTT READA$:IFC<>VAL("&H"+A$)THENPRINT"ENNOR IN LIAE"L
EN$ELSEL=L+1 NEXTI:PRINT'ALL GONE  ''
1 PRINT'NEW YOU CAN SAVE THE PROGRAM TO 015K ON TAPE AS YOU WISH ' PRINT'START A
DDRESS = &H4000' PRINT'END ADDRESS = &H4333' PRINT'EXEC ADDRESS = &H4000' PRINT'
NO  CALL IT  &H4NKTT ' END
2 DATA 4F,B7,40,8A,07,42,70,BE,00,00,BF,41,03,CA,04,3D,BE,43,34,30,000A
3 DATA BE,10,AE,01,10,BF,46,A8,EC,84,F8,40,73,83,00,02,F8,42,69,CE,0064
4 DATA 00,8A,FF-41,41,BE,43,34,BF,40,C8,10,BF,42,43,2F,42,4A,8A,40,0728
5 DATA 8A,27,1E,4F,CE,43,54,AC,C4,23,1A,AC,42,24,0E,EC,42,03,00,01,0ACB
A DATA F8,40,C0,1A,01,E4,33,48,4C,01,00,25,EA,CC,00,00,FB,41,30,FB,0886
7 DATA 48,82,10,BE,40,A8,0C,00,00,10,24,00,C8,10,BC,00,00,10,24,00,849A
8 DATA C3,AA,88,A1,A0,10,2A,00,00,CC,00,00,C3,00,01,F8,40,02,8A,40,8840
9 DATA 8A,27,14,4F,CE,43,54,AC,C4,23,0C,AC,42,25,CF,33,49,4C,01,40,0783
10 DATA 8A,25,F0,84,01,B7,40,E3,FC,40,40,F8,40,C4-FC,40,C4,F3,40,82,0B2B
11 DATA F8,60,C4,F3,40,82,10,B3,40,73,2Z,2E,CC,00,00,CE,08,80,33,C0,0814
12 DATA 34,1A,BE,00,00,30,00,AA,C4,A1,44,35,1A,2A,17,C3,88,01,10,B3,0A31
13 DATA 40,02,25,E3,34,02,8A,00,4C,07,40,E3,01,FF,35,02,25,C8,8A,40,003E
14 DATA 02,FA,40,E3,3D,1E,87-34,8A,8A,48,83,FA,40,E3,3D,E3,E1,CE,80,0A1A
15 DATA 80,27,10,34,04,CE,43,54,8A,40,5A,4A,CA,C9,30,33,C8,EC,42,A3,0756
1A DATA C4,10,A3,E4-35,0A,10,24,FF,48,10,03,41,3D,10,23,FF,40,F8,41,0802
17 DATA 3B,8A,40,E3,87,42,29,FC,40,02,F8,42,24,1A,FF,2E,CC,00,80,10,0879
18 DATA 83,00,80,10,23,08,F3,BE,41,41,8C,C0,07,25,03,7A,40,5A,BE-41,0587
19 DATA 63,10,27,00,A8,BE,80,80,BF,41,03,BE,43-34,8A,40,8A,4A,CA,D9,0A01
20 DATA 3B,30,80,A6,80,4A,27,8A,A7,88,EC,02,A3,8A,E3,04,2E,CC,00,80,0AAC
21 DATA A3,02,F3,40,A8,F8,0A,FC,40,A8,E8,02,10,03,40,A8,22,30,A3,8A,07A8
22 DATA 10,03,80,07,25,48,BF-41,F8,CE,43,54,EC,8A,10,A3,C4,23,51,10,0771
23 DATA A3,42,24,4C,8A,01,A7,08,EC,C4,A3,04,34,0A,EC,0A,A3,C4,10,A3,0828
24 DATA E1,22,12,EC,C4,F8,8A,A3,04,10,83,00,07,25,37,E3,04,E0,02,28,07C8
25 DATA 34,34,8A,EC,C4,A3,04,E3,04,E0,04,EC,4A,A3 44,10,A3,E4,24,80,0779
26 DATA 32,A2,EC,4A,A3,44,34,0A,EC,44,E0,04,E3,E4,E8,34,35,8A,25,C8,08EA
27 DATA 33,49,11,83,80,00,25,A0,20,03,7A,40 5A,FE,41,38,FF,41,41,BE,0497
28 DATA 43,54,FA,40,5A,8A,09,30,38,88,FC,40,A8,E8,01,F3,41,41,E0,01,89A6
29 DATA 34,04,FC,40,C8,E8,01,C3,00,00,E8,01,8A,80,A7,84,07,42,4A,7C,0950
30 DATA 40,8A,35,8A,10,83,42,69,22,35,BE,40,C8-38,01 BF,40,C8,BE,00,04EA
31 DATA 00,10,25,F0,F1,84,00,27,0A,8E,41,41,BF,41,03,BE,41,03,27,05,0A47
32 DATA 30,1F,BF,41,03 10,BE,40,A8,31,21,10,BF,40,40,10,8C,00,00,10,0543
33 DATA 25,F0,B8,8A,80,4C,87,42,79,B1,04,10,23,F8,8C,8E,43,34,EE,84,00CF
34 DATA FF,42,9A,EC,0E,FD,43,24,5F,FF,43,1A,F7,42,C0,8E,43,54,BF,42 0A0F
35 DATA C7,4F,BE,43,34,CE,00,00,11,A3,84,2A,07,FE,43,1A,EF,B8 10,FE,0B2C
3A DATA 42 0A,11,A3,02,2A,09,FE,43,1A EF,88,12,FE,42,9A,4C,30,04,01,077C
37 DATA 8A,25,80,8A,80,01,40,5A,24,4F 8E,00,00,11,A3,04 2A,07,FF,43,05FE
38 DATA 1A,EF,04,20,0A,11 A3,0A 2A,00,FE,43,1A,EF,0A,FE,42,9A,4C,30,0A00
39 DATA D9,01,40,8A,25,BF 8E,42 C7,11,A3,84,2A,23,FF,43,14,4F,EA 00,0834
40 DATA E0,C1,1F,38,A3,8A E0,C1,1F,30,A3,04,E0,C1,FF,43,14,EE,02 30,0970
41 DATA 09,BF,42,C7,7C,42,C0,20,0A,8E,00,40,A6,C0,A7,80,BF,43,10,FF,08AB
42 DATA 42,9A,11,83,08,00,10,25,FF,A8,FC 43,1A,BE,43,34,E0,80,1E,39,0735
```

Listing 4

```
0 POKE&H8A,4 POKE&H487,PEEK(&H8C):EXEC&HAA23:CLEAR200,(PEEK(&H8C)+0)*256-1.0TNR(4
( CLOA8M'JUKEBOX' E=PEEK(40?(425A+PEEK(4881 1FE=&H7800 THEN"=&H7AC01N=OELSEF0RN=
1TO31 1FE=PEEK(&H7A8A+N*101*25A+PEEK(&H7A07+N*101 THENE=&H7AC0+N*101ELSENEXT
1 CLS R(01=PEEK(&H8C)*256A FOR1=1TO4 PRINT'VALUE'1+ INPUTP(1)! NEXT O=E R(41=TFP(4
1+0*256*(PEEK(&H8C)+0)THENPRINT'SONRY - THAT TUNE 10 TOO LONG   TRY ANOTNER (Y/N
1 ? ' @OTO4ELSEFON1=0TO4 R(1(=R(T1+0 H-1NT(P(11/256) POKEP,H POKEP+1,P(11-256&H(
P=P+2'NEXT
2 E=P101 PRINT'POSITION THE TAPE TO LOA0 THE   NEXT TUNE ' MOTOROM AUDIOON
3 INEUT'FILENAME'1F0 MOTOROFF AUDTOOFF TFLEN(F0)>87THEN3ELSEPRINT'LOA8TNE TUNE'N'
= 'F0 CLOAONF0,0 N=N+1 1FN<31THENPNINT'ANY MORE TUNES (Y/N) ?'ELSEPNINT'THAT'0 A
S NANY AS YOU CAM PUT ONONE JUKEBOX ''' @0T05
4 F0=TNKEY0 TFF0="Y"THEN1ELSE1FF0<>"N"THEN4
5 PRINT'POSITION THE TAPE TO 0AVE THE   JUKEBOX AN0 PRE00 A KEY-''MOTOROM AUDTOO
M
A 1F1NKET0=""THEN0ELSEAUDIOOFF PNINT'SAVIN0 THE JUKEBOX' CSAVEN"JUKEBOX",E,&H7FF
F,&H7A17 CLS PRTNT'REMEMBER TO PRKE THE NUMBEN OF  THE TUNE YOU WISH TO HEAN AT'
 PRINT'116 ANN THE NUMBER OF TINES YOU WISH TO HEAR IT AT 110 0EFORE   YOU EXEC
JUKE80X  '
? PRTNT'NB  THE FINST TUNE YOU LOA0E8 ISTUNE 0 NOT TUNE 1 AN0 POKE1N0 0 AT 110 M
EANS RLAY THE TUNE AT   INFINATUN  PNESSTN0 SHTFT OR'!RNINT'CLEAP AN0 0 OR W STO
PS TNE TUNE PLAYINE  THIS COPY OF JUKE80X   START AT 'E', FOR ALL'
6 PRINT'COPIES TNE EN0 ADDRESS TS 32747 AND THE ENEC ADDNESS IS 31255 '  END
```

Listing 5

```
7800                0       ORG     $7800
7800  8C 0000      1   PLAY  CMPX    #0          4
7801                2   XCMP1 EQU     *-2
7803  26 03        3         BNE     SM1         3
7805  17 0137      4         LBSR    NEW1
7808  CC 0000      5   SM1   LDD     #0          3
780B  C3 0000      6         ADDD    #0          4
780E  88 0E        7         STB     <$0F        5
7810  97 4A        8         STA     <$4A        4
7812  8C 0000      9         CMPX    #0          4
7813               10  XCMP2 EQU     *-2
7815  26 03        11        BNE     SM2         3
7817  17 0128      12        LBSR    NEW2
781A  CC 0000      13  SM2   LDD     #0          3
781D  C3 0000      14        ADDD    #0          4
781F  88 10        15        STB     <$10        5
7821  97 4B        16        STA     <$4B        4
7823  8C 0000      17        CMPX    #0          4
7826               18  XCMP3 EQU     *-2
7828  26 03        19        BNE     SM3         3
782A  17 0117      20        LBSR    NEW3
782D  CC 0000      21  SM3   LDD     #0          3
7830  C3 0000      22        ADDD    #0          4
7833  88 2B        23        STB     <$2B        5
7835  97 50        24        STA     <$50        4
7837  8C 0000      25        CMPX    #0          4
783A               26  XCMP4 EQU     *-2
783C  26 03        27        BNE     SM4         3
783E  17 0113      28        LBSR    NEW4
7841  CC 0000      29  SM4   LDD     #0          3
```

Listing 5 continued

```
7841  C3 0000     30                ADDD    #0      4
7844  00 3F       31                STD     <$3F    5
7846  97 53       32                STA     <$53    4
7848  B6 7C00     33                LDA     $7C00   5
7849                34   WAVE1      EQU     *-2
7848  BB 7D00     35                ADDA    $7D00   5
784C                36   WAVE2      EQU     *-2
784E  BB 7E00     37                ADDA    $7E00   5
784F                38   WAVE3      EQU     *-2
7851  BB 7F00     39                ADDA    $7F00   5
7852                40   WAVE4      EQU     *-2
7854  B7 FF20     41                STA     $FF20   5
7857  30 01       42                LEAX    1,Y     5
7859  0E 00       43                JMP     <0      3
785B                44   TBLE       FDB     $844C
$7EC2,$77A5,$70EE,$6A97,$644C,$5E, F6,$59A2,$549A,
$4FBA,$4B5F,$4724
7858  86 4C
785E  7E C2
785F  77 A5
7861  70 EE
7863  6A 97
7865  64 9C
7867  5E F6
7869  59 A2
786B  54 9A
786D  4F BA
786F  4B 5F
7871  47 24
7873                45   TBLE1      FDB     RPTBL1
7873  78 97
7875                46                RMB     3
7878                47                FDB     XCMP1,RPTBL1
7878  78 01
787A  78 97
787C                48   TBLE2      FDB     RPTBL2
787C  78 C1
787E                49                RMB     3
7881                50                FDB     XCMP2,RPTBL2
7881  78 13
7883  78 C1
7885                51   TBLE3      FDB     RPTBL3
7885  78 E9
7887                52                RMB     3
788A                53                FDB     XCMP3,RPTBL3
788A  78 25
788C  78 E8
788E                54   TBLE4      FDB     RPTBL4
788E  79 15
7890                55                RMB     3
7893                56                FDB     XCMP4,RPTBL4
7893  78 37
7895  79 15
7897                57   RPTBL1     RMB     42
78C1                58   RPTBL2     RMB     42
78E9                59   RPTBL3     RMB     42
7915                60   RPTBL4     RMB     42
793F  31 8DFF30     61   NEW1       LEAY    TBLE1,PCR
7943  20 10         62              BRA     NEXT
7945  31 8DFF33     63   NEW2       LEAY    TBLE2,PCR
7949  20 0A         64              BRA     NEXT
794B  31 8DFF36     65   NEW3       LEAY    TBLE3,PCR
794F  20 04         66              BRA     NEXT
7951  31 8DFF39     67   NEW4       LEAY    TBLE4,PCR
7955  86 7B         68   NEXT       LDA     #$7B
7957  B7 FF02       69              STA     $FF02
795A  B6 FF00       70              LDA     $FF00
795B  84 50         71              ANDA    #$50
795F  26 02         72              BNE     NEXTOK
7961  35 90         73              PULS    X,PC
7963  34 10         74   NEXTOK     PSHS    X
7965  8D 60         75   NEXTVL     BSR     GTBYTE
7967  44           76              LSRA
7968  24 08         77              BCC     NOTE
796A  8D 6B         78              BSR     GTBYTE
796C  A7 22         79              STA     2,Y
796E  8D 64         80              BSR     GTBYTE
7970  A7 8C1E       81              STA     $1E,PC
7973  20 F0         82              BRA     NEXTVL
7975  44           83   NOTE       LSRA
7976  24 21         84              BCC     SMLEN
7978  A7 8C1D       85              STA     $1D,PC
797B  4F            86              CLRA
797C  5F            87              CLRB
797D  E8 23         88              STB     3,Y
797F  8D 53         89   LINK       BSR     GTBYTE
7981  81 FF         90              CMPA    #$FF
7983  26 08         91              BNE     LINKE
7985  4A            92              DECA
7986  E4 8C08       93              LDB     8,PC
7989  3D            94              NUL
798A  E3 23         95              ADDD    3,Y
798C  ED 23         96              STD     3,Y
798E  20 EF         97              BRA     LINK
7990  C6 50         98   LINKE      LDB     #$50
7991                99   TENPO      EQU     *-1
7992  3D           100              MUL
7993  E3 23        101              ADDD    3,Y
7995  ED 23        102              STD     3,Y
7997  86 00        103              LDA     #0
7999               104   STO        EQU     *-1
7999  81 3F        105   SMLEN      CMPA    #63
799B  26 04        106              BNE     NOTE1
799D  4F           107              CLRA
799E  5F           108              CLRB
799F  20 27        109              BRA     REST
79A1  84 1F        110   NOTE1      ANDA    #$1F
79A3  A4           111              LSRA
79A4  24 01        112              BCC     INCNT
79A6  40           113              NEGA
79A7  AB 22        114   INCNT      ADDA    2,Y
79A9  A7 22        115              STA     2,Y
79AB  5F           116              CLRB
79AC  5C           117   GETOCT     INCB
79AD  81 0C        118              CMPA    #12
79AF  25 04        119              BLO     OCT
79B1  80 0C        120              SUBA    #12
79B3  20 F7        121              BRA     GETOCT
79B5  30 8DFEA2    122   OCT        LEAX    TBLE,PCR
79B9  34 04        123              PSHS    B
79BB  48           124              LSLA
79BC  EC B6        125              LDD     A,X
79BE  6A E4        126   GETNTE     DEC     ,S
79C0  27 04        127              BEQ     GOTIT
79C2  44           128              LSRA
79C3  56           129              RORB
79C4  20 F8        130              BRA     GETNTE
79C6  32 61        131   GOTIT      LEAS    1,S
79C8  AE 25        132   REST       LDX     5,Y
79CA  ED 0B        133              STB     +$0B,X
79CC  EC 23        134              LDB     3,Y
79CE  E3 E4        135              ADDB    ,S
79D0  ED 84        136              STB     ,X
79D2  35 90        137              PULS    X,PC
79D4  AE A4        138   OTBYTE     LDX     ,Y
79D6  EE 84        139   NOTEN0     LDU     ,X
79D8  11A3 02      140              CMPU    2,X
79DB  25 19        141              BLO     NTRPTE
79DD  A6 06        142              LDA     6,X
79DF  27 08        143              BEQ     CONT
79E1  4A           144              DECA
79E2  26 0A        145              BNE     CONT
79E4  30 19        146              LEAX    -7,X
79E6  AF A4        147              STX     ,Y
79E8  AC 27        148              CMPX    7,Y
79EA  24 EA        149              BHS     NOTEN0
79EC  35 F0        150              PULS    X,U,Y,PC
79EE  A7 06        151   CONT       STA     6,X
79F0  EE 04        152              LDU     4,X
79F2  EF 84        153              STU     ,X
79F4  20 E0        154              BRA     NOTEN0
79F6  A6 C0        155   NTRPTE     LDA     ,U+
79F8  27 03        156              BEQ     REPEAT
79FA  EF 84        157              STU     ,X
79FC  39           158              RTS
79FD  30 07        159   REPEAT     LEAX    7,X
79FF  AF A4        160              STX     ,Y
7A01  37 02        161              PULU    A
7A03  A7 06        162              STA     6,X
7A05  1F 30        163              TFR     U,D
7A07  A3 C1        164              SUBD    ,U++
7A09  ED 84        165              STD     ,X
```

Listing 5 continued

```
7A0B   ED 04      166          STB   4,X
7A0D   1F 30      167          TFR   U,B
7A0F   A3 C1      168          SUBD  ,U++
7A11   EF 1F      169          STU   -7,X
7A13   ED 02      170          STD   2,X
7A15   20 BF      171          BRA   #OTEND
7A17   1F B8      172  START   TFR   DP,A
7A19   A7 8B009F  173          STA   DPSTO,PCR
7A1D   1F 50      174          TFR   PC,D
7A1F   83 7A1F    175  COMP    SUBD  #CONP
7A22   50         176          TSTB
7A23   27 01      177          BEQ   OK
7A25   39         178          RTS
7A26   B8 7B      179  OK      EORA  #$7B
7A28   1F 88      180          TFR   A,DP
7A2A   86 7B      181          LDB   <$7B
7A2C   D8 73      182          STB   <$73
7A2E   97 7B      183          STA   <$7B
7A30   97 7A      184          STA   <$7A
7A32   C6 84      185          LDB   <$84
7A34   D0 7C      186          STO   <$7C
7A36   97 81      187          STA   <$81
7A38   97 83      188          STA   <$83
7A3A   C6 80      189          LDB   <$80
7A3C   D0 85      190          STB   <$85
7A3E   97 8A      191          STA   <$8A
7A40   97 8C      192          STA   <$8C
7A42   97 93      193          STA   <$93
7A44   4C         194          INCA
7A45   C6 96      195          LDB   <$96
7A47   D0 8E      196          STB   <$8E
7A49   97 95      197          STA   <$95
7A4B   86 03      198          EORA  #3
7A4D   97 49      199          STA   <$49
7A4F   8B 01      200          ADDA  #1
7A51   97 4C      201          STA   <$4C
7A53   8B 01      202          ADDA  #1
7A55   97 4F      203          STA   <$4F
7A57   8B 01      204          ADDA  #1
7A59   97 52      205          STA   <$52
7A5B   DE 73      206          LDU   <$73
7A5D   31 8D005F  207          LEAY  TUNES,PCR
7A61   80 7F      208          SUBA  #$7F
7A63   34 02      209          PSHS  A
7A65   86 0076    210          LDA   >$76
7A68   C6 0A      211          LDB   #10
7A6A   3D         212          MUL
7A6B   31 A8      213          LEAY  D,Y
7A6D   C6 04      214          LDB   #4
7A6F   AE A1      215  LOOP    LDX   ,Y++
7A71   AF C4      216          STX   ,U
7A73   AF 44      217          STX   4,U
7A75   A6 C4      218          LDA   ,U
7A77   A0 E4      219          ADDA  ,S
7A79   A7 44      220          STA   4,U
7A7B   A7 C1      221          STA   ,U++
7A7D   AE A4      222          LDX   ,Y
7A7F   AF C4      223          STX   ,U
7A81   A6 C4      224          LDA   ,U
7A83   A8 E4      225          ADDA  ,S
7A85   A7 C4      226          STA   ,U
7A87   86 0077    227          LDA   >$77
7A8A   A7 44      228          STA   4,U
7A8C   33 C828    229          LEAU  40,U
7A8F   5A         230          DECB
7A90   26 00      231          BNE   LOOP
7A92   32 61      232          LEAS  1,S
7A94   1A 50      233          ORCC  #$50
7A96   86 FF01    234          LDA   #FF01
7A99   84 F7      235          ANDA  #$F7
7A9B   B7 FF01    236          STA   $FF01
7A9E   B6 FF03    237          LDA   $FF03
7AA1   84 F7      238          ANDA  #$F7
7AA3   B7 FF03    239          STA   $FF03
7AA6   B6 FF23    240          LDA   $FF23
7AA9   8A 08      241          ORA   #8
7AAB   B7 FF23    242          STA   $FF23
7AAE   8E 0000    243          LDX   #0
7AB1   9F 01      244          STX   <$1
7AB3   9F 13      245          STX   <$13
7AB5   9F 25      246          STX   <$25
7AB7   9F 37      247          STX   <$37
7AB9   9B 00      248          JSR   <0
7ABB   86 00      249  RSTDP   LDA   #0
7ABC              250  OPSTO   EQU   $-1
7ABD   1F 8B      251          TFR   A,DP
7ABF   39         252          RTS
7AC0              253  TUNES   RMB   320
7C00              254  222     END   START
```

Listing 6

```
0 CLEAR200,&H7FFF:L=0:FORT=&H7800TO&H7859:READA$:A=VAL("&H"+A$):C=C+A:POKET,A:NEXT:IFC<>&H1FE0THENPRINT"ERROR IN LINE";PEEK(283)+256*PEEK(284):END
1 FORI=&H7FFF TO&H7A8F STEP20 C=0 FORJ=I TO I+19 READA$:A=VAL("&H"+A$):C=C+A:POKEJ,A:NEXTJ:READA$:IFC<>VAL("&H"+A$)THENPRINT"ERROR IN LINE";L:END ELSEL=L+1:NEXTI:P
RINT"ALL DATA CORRECT  SAVE WAVES PLEASE WAIT"
2 FORI=0TO255:A=32+31*SIN(3.1415*I/128):FORJ=&H7C00TO&H7E00STEP256:POKEJ+I,A:NEXTJ,I:PRINT"NOW YOU CAN SAVE THE PROGRAM TO DISK OR TAPE AS YOU WISH":PRINT"START ADDRESS = &H7800":PRINT"END ADDRESS = &H7FFF":PRINT"EXEC ADDRESS = &H7A17
3 PRINT"NB  CALL IT  TUNEBOX":END
4 DATA 8C,00,00,26,03,17,01,37,CC,00,00,C3,00,00,73,CE,7A,4A,8C,00,04FA
5 DATA 00,26,03,17,01,28,CC,00,C3,DD,DB,DB,13,E7,4B,8C,01,00,2A,04BB
6 DATA D3,17,01,1E,CC,00,00,C3,00,DD,DB,2B,E7,50,8C,00,00,26,03,17,0496
7 DATA E1,13,CC,00,00,C3,DB,DB,DB,3F,E7,53,8A,7C,00,DB,7E,00,DB,7E,0740
8 DATA DD,DB,7F,00,B7,FF,20,3D,01,0E,00,86,4C,7E,C2,77,65 70 EE,6A,0845
9 DATA 97,64,9C,5E,F6,5F,A2,54,9A,4F,BA,4B,5F,47,24,72,E7,00,00-00,0421
10 DATA 7B,01,7B,E7,7B,C1,00,DD 00,7B,13,7B,C1,7B,E8,00-00,00,7B,25,B485
11 DATA 7B-EB,7B,15,DB,DB,00,7B,37 7B,15,00,00,00,00,DB,00,00,00,032E
12 DATA 31,BD FF,30,20,1B,31,BB,FF,33,2D,DA,31,BB,FF,3A,20,04,31,BB,0700
13 DATA FF,3B,86,7B,B7,FF,02,BA,FF,00,B4,50,2A,02,35,8A,34,10,BD,6B,08A7
14 DATA 44,24,0B,BD,8B,A7,22,BB,44,A7,8C,1E,20,F0,44,24,21,A7,8C,1B,075C
15 DATA 4F,5F,FB,23,BB,53,B1,FF,2A,DB,4A,EA,8C,DB,3B-E3,23,ED,23,20 0886
16 DATA EF,CA,50,3B,E3,23,ED,23,BA,00-B1,3F,26 04,4F,5F,20,27,BB 1F,0760
17 DATA 44,24,01,40,A8,22,A7 22,5F,5C,81,0C,25,04,80-0C 20,F7,30,BB,0A10
18 DATA FE,A2,34,04,4B,EC,B6,AA,E4 27,04,44,5A,2B,F8,32,61,AE,25,EB,0618
19 DATA BB,EC,23,E3,E4,EB,B4,35,90,AE,A4,EE,B4,11,A3,B2,25,1F,AA,DA,0978
20 DATA 27,DB,4A,26,DA,30,1F,AF,A4,AC,27,24,EA,35,F0,A7-BA,EE,04,EF,07BE
21 DATA B4,20,EB,AA,C0,27,03,EF,B4,3F,30,07,AF,A4,37,02,A7,DA,1F,30,077F
22 DATA A3,C1,ED,B4 ED,B4,1F,30,A3,C1,EF,1F,EE,02,20,BF,1F,BB,A7,BA,0A5A
23 DATA 00,9F,1F,50,83,7A,1F,50,27,01,39,BB-7B 1F,BB,06 7B,BB 23,B7,07CB
24 DATA 7B,B7,7A,BA,B4,BB,2C,B7-B1 B7,B3,BA-BB,BB,B5,B7 BA,B7,AC,47,0C0E
25 DATA 93,4C,BA,9A,6B,BE-B7,B5,6B,03 B7,4F,B5 01,B7,4E,B5,01,B7,4F,0B31
26 DATA BB,01,B7,52-BE-73,31-BB-DD,5F,80,7F,34,02,B6,BB 76,C6,BA,1F,0B31
27 DATA 31,AB-CA,04,AE,A1,AF,C4,AF,44,A6,C4,AB,E4,A7,44,A7,C1,AE,44,08F0
28 DATA AF,C4,A6,C4,AB,E4,A7,C4,B6,00,77,A7,44,33,CB,28,5A,26,BB,32,0AA1
29 DATA A1,1A,50,B6,FF,B1,B4,F7,B7,FF,01,B6,FF,03,84,F7,B7,FF,03,B6,0855
30 DATA FF,23,BA,08,B7,FF,23,BE,BB,00,9F,B1,9F,13,9F,25,9F,37,90,00-07A4
31 DATA 8A,80,1F,89,39,BB,00,00,00,BB,BB,00,00,00,00,00,00,BB,80,80,01A9
```

Listing 7

```
[illegible]
F  J=  P  =  =  =  C  D=  NOIOFON AUBTOON GOSUBA AUBTOOAA A=OOAM THA=A=V  I M
A= 231 PAMI=  =  =T02 2  F AASA WAIT   SETTING UP THE   INITIAL  BASA  WAVA
 AOPNS
I JS-PEEK=H  4  J PEK  A0A  PFLS SAPAAA I AOPV OIOIS PEABT P.GOSUB? NEXT FOTOI?
2 POKE=H2620,AH=  W 1E  OT FAA= W  =SPHARA-STPKIPI POKFAN2AOI P A=AAAAN2A00 A SA
IAT (IAAAAETWI =AAUT? IF  =  FIA S B I A=AFJH?A?2 ELSAIFT 2THEHA= WI  TPIAAT AA
F  POKA=H2A2B C A A I  =  ?
7 IAT  THENPATUPPEISAA= W  =  IF  STP= P  =  W=200  =W=*=AIAPEI OTO255 POKA?=  I P
*177 S4SINIS I4IS*=P%(  =?A=IPAVT PATHPA
4 ALS PRTAT*THE CURVANT BASA WAVES APA   * PRINT AOPI=OIOIS PP(NTCHP=(P I+I A= I
  *I WAVT PRINT PATUPN
5 AAS PRINT*THE CURRENT BUTAT WAVES APE     *=AOP( (ATO23 PRINTCHP=I=  I5IAT I
  I AAVI PRINT PATUPM
6 POKA1A3 I AYACA0853 A=-INKEY$ (PA=""THENAEASEPPIUNA
* ALS PRINT POSITION THE TAPE* MOTSPPN AUB(CONTIAPUT*AILEHAME =(A= IA(FNIA=  PIA
AN?A= SANOTOPSEP AUBTOOFF:PETUPN
8 PRINT"DOLA YOU ATKE TO *99* (Y/N( ? *(
= BOSUBA IAA=="T"ORAB "N THENPPRINTA= PAIUPNEASE=
I0 INPUT"WHICH "TA TAA?(EPPA?K? THENIPALSEY=?+(A ((=256 RETUPP
I1 PPINT*WHIAN ANABBAA (I A( ? "(
12 GOSUBA IAAB(*I"ORA=\ A*THAN12PLSEPPINTA= W=A=?00+VAL(PP(=425A RETUPN
13 AAS PRINT814  "MENU":PRINT=A=  "D  AATAP A  BASA  WAVE * PRINT"  I  BUILD A NEW
 WAVE " PRINT"  2  VIEW A WAVA "(PPINT  3  VIAW INP A WAVAS IN USE   PPINT"  4
 USE A WAVE ON A ANANNEL " PRINT"  5  PLAY A TUNA " PRINT"  A  SAVA THA BUTAT WA
VES "
14 MBINT" ?  9AVE THE BASE WAVES   PPINT"  8  SAVE THA JUKEBOX VITA (I 5      H
EW WAVE AOPN( " PRINT"  =  LOAD SOME WAVES   PRINT PRINT"WHAT NEXI ? "(
15 GOSUBA IAA&(*8"=BAA& "="THENI5ELSEONVAL(A=(=IOBSUBTA 21 2A,32,33 3= A2 43 AA A
5 BOTOI3
IA =BSUBA IMEUT*ALTAN WHICH  I IA(  "(A IPACIOPA?IATHEMIAALSEW A I PRINT"PLAA=P S
ELEAT THA NEW TYPE   " PRINT"O  BOWAPA= "I  SANTOOTH= "2  TMIANOULAR= "3  SIAA=
 WNTAA (0 3( ? *(
17 BOSUBA IFAB(="8"ONAA9"3"THENI?ELSEPPINTAB I=VAL(A8( TAT (ENT*2THEN20AA9AC(S
I8 TAT THAN(INPUT*ABBMONIC (( IA( "IF:IAP(IOP(ITATHEN(BEASE20
I= INPUT"PULSE WIDTH (( 255( "IF IFP(IOP= 255THENT=
20 BOSUB2 B0="ALTER ANY MORE BASE  WAVES" BOSUBSTEA=  T THENTAPI SEMETURN
21 A=0 ALS PRINT"NOW SELEAT THE RALATIVE AMOUNTS OF THE BASE WAVES TO BE USE
 "IAOP(=T?BIS PHINT"WAVE I+I1A=BI( PPINT AMOUNT ( 0  "I TEA THENPPINI2S? A=1 "IF
LSEPPINT255*( "(
22 INPUT# (FB<OORA=0 255THAN22ELSETEA OANE= PEN2?2ELSEPOKE=H275A+I  = A A1=.NA
PT GOSUBS
23 INPUT"WHICH OF THESE DO YOU WISH TO   NEPLAE I( 0(   W TEW(IOPW 8THEA23ALSEP
OKE=H25AB,=H27=W PPINT"PLEASE NAME THE NAW WAVE TH LESSTAAN I3 ABIIEPE   " W=W=I
5 A8(N(="
24 EOM( (T012 BOSUBA PRINTA=; TEA=< CHP=II3ITHENA=(I(=A=IW(=A0 NAYT
25 CLS PPINT"THP NANE OF THE MEW WAVE IS" PRINT"      "A=(W(    B=*"TYPE IN A NEW
 ONE" BOSUBB TEA=*"Y"THENA=IW(="  GOTO2AELSAA%EA=N?A42 B=*"BUTLD ANY NOPEWAVAS"
BOSUB=  TEA=-"Y"THEN2IELSENETURN
26 CLS:PRINT"  BELAAT WHAT YOU WISH TO VIAW      PPINT@= "I  A  BASE  WAVA " PPIA
T"  2  A BUTAT WAVE " EOPI=IT04 PRINT" "I+2(CHP=(BI    THE WAVE FOR ANANNEL"T(CHP
=(BI" " NEXT PPINT@320, WHIAN (( &( ? "(
27 =BSUBA IAA= "I"=RA=\"A"THEN2?EASAPPINA= A=VAL(A9( (PA=I=THENY=&H30=0 BOSUBAIM
X=IAELSE(PA=2THENX=&HB=== BOSUBS MX=BELSA2=
28 BOSUBT SCREENT LINA  ,PEEK(Y B3/4 ,PRESET EOPI IT3255 AINE (I PEEK(Y+(IB3/4
I PRST(=BOTO3=
29 W=&H?CB0=256=IA 3I SANAENI LINE=0 PEEK(W =3  PPESET=EOPI IT0255 LINE IT PEAK
(I+W(=3),PSET
30 NAXT GOSUBA (PA==   THENPCLS
31 B==  VIEW ANT MORE WAVES  =OSUBB IFA=  Y"THANZAPLSEPEIURN
32 SAPEANI F003(=BTO3 LINE 10-PEEK(W*C00+I4254 =3/A=I=A0( PRESET FOPI=(IO2=5 LIN
A 13 PAAPIB=H?C0B(=I4254+J(83/A+I640( PSAI NEXTJ I BOSUBA(=PCLS:PETURN
33 ALS PRINT"WHICH BO YOU WISH TO USA I   PPINT"=  "I  A BUILT WAVA (PPINT   ?
A BASA WAVA (PPINT   "  A WAVA ACPAAN  I USA   PRIT APINT PLAASA =A A
A BASA WAVE" PRINT"  3  A WAVE ALREADY IN USA  PRINT PAINT PLEASE SEABAT (I 3) ?
"
3A BOAUBA IAA=  T THE=B=H4?B== BOSUB5 MX"BEASAIAA=  ? THAN=-&H3000 BOSUBA MX (AP
LSEPNINT PPINT"EPBM  "  BOTO37AASE3A
35 BOSUBT@:PN(NT USA IT ON   BOSUBIT
3= INPUT VOLUNA IT A3(  (MX IFMXX(O=NN A3TAAN3AALSAAORT OTO255 POKEW+I  12+(PEEK
X+I( I27-5(4NX/?5% NEXT=BBIO38
37 GOSUBTIIX W PPINT USA IT ON "( GOSUBII FOPI=TO255 POKPW+I PAEKI  TI NAXT
3B =B  USE ANY BOPE  WAVAS" BNSUB= IAA=  T"IAEA33ALSEPETURN
3= CLS INPUT TUNE NUABAN I0 3T(  "IA IAA  3OPA "(THAN?=ELSETNPUT PAPAAI9 (( ?55 (
CENT (  (( IAB OORB 25%THAN3=PLSEPOPATIB A POKEITS I PRINTB22A  PPES9 SATAT OP C
LEAN ANS  =  PB  W  TO STOP THE TUNE" EXEA=A?A)"
AO =B=*NEAR ANOTHEN  TUNE  =OSUB= (PA=  Y INENSSALSENETURN
4I GOSUB7 PNINT"PRESS A KAY TO SAVA  "A=" " B=-A= BOSUBA ALS PPINT92AA "SAVIAG
"=B= " RETURN
A2 GOSUBAT AGAVEMB=-&N2B08 WHZAEA AIT=A1=ETUPA
43 SOSUBAT CSAVEABB=-&N3000 WHJAPP 4I(94 RETUPN
44 OOSUBAI ASAVPMB= IA WHAAAA ANAAI  PATURN
A5 GOSUB? PNINT"PRESS A KAY TO LOAP   A="  B=-A= GOSUBA CAS PPINT@2A6  LOABIHS
 =B= " ALNAUNB= PATUP?
4A BATA3 I 3 2 3 3 3 A 3 5 3 A I ? 3 9   P  (0    I ? ? ? 3  I=B I ( ?
```

Listing 8

```
2400                    0          ORG     $2600
2400  96 40            1  $BUAWE  LDA     $040
2402                    2  PLSWBT  EOU     *-I
2402  B7 240F           3          STA     $TO1
2405  40                4          NEGA
2406  B7 2413           5          STA     $TO2
2409  BE 2628           6          LDX     WVPS
240C  IF 10              7          TFR     X,0
240E  C1 00              8  $BP(   CMPB    #0
2410  =                 9  $TO1    EOU     *-(
2410  25 06             10         BLO     $BRNX
2412  C1 00             11         CMPB    #0
2413                    12 $TO2    EOU     *-I
2414  25 03             13         BLO     $BRNF
2416  5F                14         CLRB
2417  20 06             15         BRA     $BNV
2419  C6 00             16 $BPNF   LDB     #$00
241B  20 02             17         BRA     $BNV
241D  C6 FF             18 $BPNV   LDB     #$FF
241F  E7 00             19 $BNV    STB     ,X+
2421  IF 10             20         TFR     X,P
2423  50                21         TSTB
2424  26 E8             22         BNE     $BP(
2426  3=                23         RTS
2427  8E 3000           24  T0ISWT  LDX     #$3000
2428                    25 WWPS    EOU     *-2
242A  96 00             26         LDA     #0
242B                    27 T$F     EOU     *-I
242C  34 02             28         PSHS    A
242E  IF 10             29         TFR     X,0
```

Listing 8 continued

```
2630  4F E4          30   VV      TST     ,S
2632  26 05          31            BNE     SWTWV
2634  5D             32            TSTB
2635  2A 01          33            BPL     TR11
2637  53             34            COMB
2638  5B             35   TR11     LSLB
263*  F7 BO          36   SWTWV    STB     ,Y+
263B  1F 1B          37            TFR     Y,D
263D  5D             38            TSTB
263F  26 FB          39            BNE     VV
2640  35 B2          40            PULS    A,PC
2642  BF 3DDB        41   STABT    LDX     #$3DDB
2645  4F             42            CLRA
2646  5F             43            CLRB
2647  FB 2668        44            STB     MAXVL
264A  4A             45            DECA
264B  5A             46            DECB
264C  FB 2671        47            STB     MINVL
264F  CE 2756        48   L1       LDU     #VALS
2652  4F             49            CLRA
2653  5F             50            CLRB
2654  34 0B          51   L2       PSHS    D
2656  A6 C0          52            LDA     ,U+
2658  E6 84          53            LDB     ,X
265A  3D             54            MUL
265B  E3 E1          55            ADDD    ,S++
265D  30 A9010B      56            LEAX    256,Y
2661  BC 4000        57            CMPX    #$4000
2664  25 EE          58            BLO     L2
2666 1083 0000       59            CMPD    #0
266B                 60   MAXVL    EQU     *-2
266A  23 B3          61            BLS     MXOK
266C  FB 2668        62            STB     MAXVL
266F 1083 FFFF       63   MXOK     CMPD    #$FFFF
2673                 64   MINVL    EQU     *-2
2673  24 B3          65            BHS     L3
2675  FB 2671        66            STB     MINVL
2678  30 89F001      67   L3       LEAX    -$FFF,X
267C  BC 3100        68            CMPX    #$3100
267F  25 CE          69            BLO     L1
2681  FC 2668        70            LDD     MAXVL
2684  B3 2671        71            SUBD    MINVL
2687  B7 269A        72            STA     BVSB1
268A  F7 26AF        73            STB     BVSR2
268D  CC 8000        74            LDD     #$8000
2690  FD 26BF        75            STD     CURVL
2693  B7 269C        76            STA     VL1
2696  F7 26A4        77            STB     VL2
2699  B6 00          78   DIV1     LDA     #0
269A                 79   BVSB1    EQU     *-1
269B  C6 00          80            LDB     #0
269C                 81   VL1      EQU     *-1
269E  3D             82            MUL
269F  34 06          83            PSHS    D
26A0  B6 269A        84            LDA     BVSR1
26A3  CA BB          85            ORB     #0
26A4                 86   VL2      EQU     *-1
26A5  3D             87            MUL
26A6  34 06          88            PSHS    D
26A8  B6 00          89            LDA     #0
26AA                 90   BVSR2    EQU     *-1
26AA  F6 269C        91            LDB     VL1
26AD  3D             92            MUL
26AE  34 06          93            PSHS    D
26B0  B6 26AF        94            LDA     BVSR2
26B3  FB 26A4        95            ADDB    VL2
26B6  3D             96            MUL
26B7  1F 89          97            TFR     A,B
26B9  4F             98            CLRA
26BA  E3 F1          99            ADDD    ,S++
26BC  E3 E1          100           ADDD    ,S++
26BE  5D             101           TSTB
```

```
26BF  2A 01          102           BPL     DIV2
26C1  4C             103           INCA
26C2  1F B-          104   DIV2    TFR     A,B
26C4  AF             105           CLRA
26C5  E3 E1          106           ADDD    ,S++
26C7 1083 DBFF       107           CMPD    #$DBFF
26CB  23 11          108           BLS     DIV3
26CD  FC 240F        109           LDD     CURVL
26D0  43             110           COMA
26D1  53             111           COMB
26D2  B4 269C        112           ANDA    VL1
26D5  B7 269C        113           STA     VL1
26D8  F4 26A4        114           ANDB    VL2
26DB  F7 26A4        115           STB     VL2
26DF  CC 0000        116   DIV3    LDD     #0
26BF                 117   CURVL   EQU     *-2
26E1  44             118           LSRA
26E2  56             119           RORB
26E3  25 11          120           BCS     DIVDN
26E5  FB 26BF        121           STB     CURVL
26E8  BA 269C        122           ORA     VL1
26EB  B7 269C        123           STA     VL1
26EE  FA 26A4        124           ORB     VL2
26F1  F7 26A4        125           STB     VL2
26F4  20 A3          126           BRA     DIV1
26F6  8E 3000        127   DIVDR   LDX     #$3000
26F9 108E 2000       128           LDY     #$2000
26FD                 129   NEWAVE  EQU     *-2
26FD  CE 2756        130   L4      LDU     #VALS
2700  4F             131           CLRA
2701  5F             132           CLRB
2702  34 0A          133   L5      PSHS    B
2704  A6 C0          134           LDA     ,U+
2706  E6 84          135           LDB     ,X
2708  3D             136           MUL
2709  E3 E1          137           ADDD    ,S++
270B  3D 8901BB      138           LEAX    256,X
270F  BC 40BB        139           CMPX    #$4000
2712  25 FF          140           BLO     L5
2714  B3 2671        141           SUBD    MINVL
2717  B7 2724        142           STA     M
271A  F7 2725        143           STB     L
271D  FA 269C        144           LDB     VL1
2720  3D             145           MUL
2721  34 06          146           PSHS    D
2723  B6 BB          147           LDA     #$B
2724                 148   M       EQU     *-1
2725  F6 26A4        149           LDB     VL2
2728  3D             150           MUL
2729  34 06          151           PSHS    D
272B  B6 00          152           LDA     #0
272C                 153   L       EQU     *-1
272D  F6 269C        154           LDB     VL1
2730  3D             155           MUL
2731  34 06          156           PSHS    D
2733  B6 272C        157           LDA     L
2736  F6 26A4        158           LDB     VL2
2739  3D             159           MUL
273A  1F B9          160           TFR     A,B
273C  4F             161           CLRA
273D  E3 E1          162           ADDD    ,S++
273F  E3 F1          163           ADDD    ,S++
2741  5D             164           TSTB
2742  2A D1          165           BPL     OK
2744  4C             166           INCA
2745  1F B9          167   OK      TFR     A,B
2747  4F             168           CLRA
2748  E3 E1          169           ADDD    ,S++
274A  E7 A0          170           STB     ,Y+
274C  30 89F001      171           LEAX    -$FFF,X
2750  8C 3100        172           CMPX    #$3100
2753  25 A8          173           BLO     L4
2755  3D             174           RTS
2756                 175   VALS    RMB     16
2766                 176   ZZZ     END     START
```

Listing 9

```
0 PCLEAR1 CLEAR200 &HE3FF L=21F8A1+&H1600 T=&H2705 ST$P2B1C=0 FOR J=1 TO 419 READ
A$ A=VAL("&H"+A$) C=C+A POKE J, A NEXT J READ A$ IF C<>VAL("&H"+A$) THEN PRINT"ERROR IN LINE";ERL:END ELSE GOTO
NEXT: PRINT"ALL DONE !!!" : PRINT NOW YOU CAN SAVE THE PROGRAM TO DISK OR TAPE AS YOU WISH " PRINT"START
ADDRESS = &H2600" PRINT"END ADDRESS = &H2753":PRINT"EXEC ADDRESS =&H2642":PRINT"N A- CALL 11 WAVEMIX ":END
7 00A A6 A0,B7 26 BF,4D,2A B7 2B 15,BE,26,2B 1F 10,C1,00 2B 05,CB
8 00B A 25,A3,E7 80,1F 89,C6,20,D8 EA,FF,E7 80,1F 10,3A,26,B8 39 B6 B7 A2
9 00A 30 00,86,00,34 02 1F,16,8B 8A 26,05,5B 2A 01,53,5B E7 80,1F 05,5D
A 00A 10 5B 2A,F8,35 06,BE,3B,00,AF 5F F8,26,4B,6A 3A F8,2A 71 CE 8B
B 00A 27 36 4F,5F,3A,86 A6,C0,E6,00 38,E3,E1,3D 81 FA,BC,00 00,B7 AC
C 00A 25,E8 1B 83 00,00,23,03,FB,26,40 10,A3,FF,FF 2A,03 FB,26,71 B7 A3
D 00A 30 89 F0 01,A6,C0 31,00,25,CE FC,26 4B,83 26,71,B7 26 9A,F7,26 AC2
E 00A A9 CC,00,00 FD 26 BF,B7,26,9C,F7,26 AA,A6,00 C4 80,38,3A,86,00FA
F 00A A6 26 9A,C4 38 38,3A,86,86 00 F8,2A 9C 3B 3A,00 00,26 A9 F6,09E3
11 00A 26 AA 39,1F,89,4F,E3,E1,83 E1 00,2A 01 4C,1F 89,AF,E3,E1 16 B925
12 00A 83 00 FF,25 11 FC 26,BE,A3 33 8A 26,9C,B2 26 9C,FA,26,AA F7 89F1
13 00A 26,A4 CC 00,00,44 56 25 11,FB 26 BF,3A,26,9C B7 26,9C,FA,26 8B7B
1A 00A A4,F7 26,AA,20,A3 8E 30,00,10 8E 20,00,CE 27 56 AF,5F,34,00 88BE
1B 00A A6,C0,E8 8A 38,E3 81 38 39,01 00 8C A0,00,25 EE 83 26,71,B7,AA68
1C 00A 27,24,F7 27 2C,FA 26 9C 38,3A,00 86 00,F6,26,A4 38 3A,86,86,B797
1D 00A 88,F6,24,9C 38,3A,86,86 27 2C,F6 26 A4 38 1F,89,4F E3,81,E3,00BC
1E 00A 81 38 2A,E1 AC,1F,89 4F,E3=E1,B7,A6 38 39,F6,61,8C 31 00,25,00B3
1F 00A A0 39,00,00 00 00,00,00 00 00,00,00 00,00,00 00 FF,FF,0EBF
```

I LL begin a hymn of praise to the herd working Sandra Sharkey who will soon be producing as many magazines as she has children (five so far but only two magazines yet) *Adventure Probe* has been going for some time now a general forum of hints tips solutions and letters and gossip all about adventures This has now been joined by another magazine called *Soothsayer*, which is TOTALLY maps and solutions Nothing else just maps and solutions Now I know that some of you may disapprove of this sort of thing but if that s the case, then why do you keep writing to me for help? Personally I'm all for it, and if you want to see a sample issue of either *Soothsayer* or *Adventure Probe* then send a quid to Sandra at 78 Merton Road Highfield, Wigan Lancashire WN3 6AT and a magazine will be winging its way back to you before you can say *Colossal Cave* Provided that she a not playing pool or down the pub Where were you all the last pool delegates' meeting, eh, Sandra?

Mrs Webb of Liverpool appears to be having trouble locating hints for *Fishy Business* so here we go courtesy of Salamander By the way Mrs Webb, I saw what was crossed out on your envelope just why is a person interested in *Fishy Business* when the company name that was crossed out is Shrimp Manufacturing? Fish salamanders and shrimps oh well this will put them in their place.

1) Everything around here starts underwater which is all right if you don't mind looking like a prune
2) Don I go too far from the island
3) Laser pistols are really cutting weapons
4) Don I be afraid of the dark.
5) Shellfish are great music lovers, but octopussys prefer cake
6) Those seahorses are too fat already
7) Scrolls should be read in the right light
8) The strangest things are said behind thrones
9) Frog-kings aren't that dumb Their harems are well hidden
10) It s not easy being green so be affectionate

The hero s progress? Ought to be a deb hand by now Sorry I said that on porpoise

Ahem Back to the land of adventures again and more hints asked for This time the game is *Medness and Minotaur* The person is J Edgar of Windsor (posh! I wonder if he could introduce me to Lady Di) the company is Dragon Data so here we go

Ask the oracle

1) The oracle tells you what you need to kill creatures ASK ORACLE to find out what you need get the weapons and kill creatures.
2) You must TIE HYDRA with the ropes before you can kill it.
3) You can OPEN CRYPT only if you are at peak strength and holding nothing
4) The drapes in the room with the narcissus plants have a 16% chance of opening — you get only one chance to OPEN DRAPES each game (P/G talking — this is the sort of stupid problem that should not exist in an adventure)
5) The sprite will cause any object on the ground in his room to be randomly relocated The vial will prevent this as will placing objects in the music room on the first floor
6) When the 'walls glow an eerie colour' turn off the lamp and LOOK

7) You must PLAY FLUTE in the 'music' room and hold parchment to see the ledge Then use rope to CLIMB LEDGE to get a treasure
8) Many hard to find places may only be reached by jumping ie JUMP PIT JUMP HOLE JUMP POOL JUMP MIST JUMP UP JUMP DOWN or JUMP
9) Use OKKAN to learn the secret of the glowing rocks
10) You need the FOOD (1st floor) and the MUSHROOM (3rd floor) to learn the first spell
11) Use VETAR to recover the lamp if it is blown out of your hands Then turn it on
12) The URN contains oil to fill the lamp
13) Once all the spells are learned, some pools of oil may be found at random
14) AKHIROM will cause the scarab to glow A glowing scarab will keep you from getting hurt (must take one to the pub with me on Friday nights)
15) Dimly lit rooms on the first floor may require a lamp to see everything
16) LOOK POOL works in one room

I don I know about you but I didn't like the game at all as it relies far too much on random events I m all in favour of random things happening as they do in real life so they must in adventures but this one was taking things a bit too far What do you think?

Letter time

Pulls a letter from the pile and finds the name Nick Welham staring at him Nick lives at 27 Duke Drive Clophem Bedford Bedfordshire MK41 6DE and can offer help on the following thousand or so adventures *Aquanaut 471 Ice Kingdom, Towers of Doom Trekboer Franklins Tomb, Caverns of Doom Juxtaposition El Dreblero, Dragon Mountain Lost in Space Celtoi to Island* and *Return of the Ring* SAE as usual

Bartering time folks because Nick goes on to say 'If anyone has any of the following adventures I would be willing to either swap or buy them *Black Sanctum, Shenenigans Wings of War Mansions of Doom* or any Scott Adams adventure So there you go you can barter away to your heart s content

Two of the Scott Adams series of games were the second and third adventures that I ever played and these were *Adventureland* and *Pirate Adventure* *Colossal Cave* was the first by the way Anyway if anyone can cast

their minds back BDU (Before Dragon User) to 1978 they may remember an issue of an American magazine called *Byte* which was devoted to adventures. In it there was a complete listing in Basic for *Pirate Adventure*! What would people give for a copy of that now I wonder.

Don't all write in asking for a copy from me, because I haven't got one it disappeared in a house move much to my intense annoyance.

Scott Adams

I think there must be two categories of people as far as Scott Adams games are concerned. In those early days with only *Colossal Cave* to compare him against I marvelled at how he could possibly fit an entire adventure into the computer's memory all at once. Then as adventures progressed I began to wonder why he didn't progress as well: even the most ardent fan has to admit that his room descriptions are not particularly atmospheric. And look at things like *The Hulk*: 16 locations and you spend most of your time digging over and over again to find umpteen games? Okay he might have had to pay a lot of money for the rights to the character but dear me *Spiderman* too: a popular character but a not very brilliant adventure. And yet the man did a lot to popularise adventures so we can't be too hard on him. If it wasn't for him and the team behind Infocom we might never have had adventures on home computers at all.

Looks through rest of letters requests for help and hint sheets, so I shall take the risky step of printing the rest of the *Syzygy* solution since I still get millions of letters about it. Well okay I exaggerate slightly, thousands then. Without the benefit of a wonder memory I cannot recall whether it was the November or December issue which featured the first ten steps of the solution (and in case you're wondering why I don't just look it up it's because this is being written before I've seen either of those two issues and our beloved editor has the power to print or not to print as she sees fit) *(I just print these things I don't remember them! — Ed.)* up to the archway outside and entering the corridor. This is the rest of them so don't read if you don't want to know.

11) Go to the other main computer and look at screen
12) Go to the transporter and enter co-ordinates for planet (see below). Be sure to save game here so that it can be returned to later in the event of a disaster
13) Go to the plant and fall off the cliff
14) Listen and if you can't hear anything then go back to step 12 reload and repeat until you can hear something
15) When there is a sound, GET COMMUNICATOR and USE COMMUNICATOR
16) Enter co-ordinates for emerald
17) Get emerald and return using communicator
18) Go to Darth Vader by the transporter
19) Kill him
20) Return using the communicator again
21) Go to the lift and press the button twice.
22) Go through the forcefield
23) THE END

Note, don't forget to breathe at places other than the airless corridor from step 10 onwards.

Co-ordinates for transporters: Planet 0-4-1-5, Emerald 2-7-3-0, Vader 1-6-0-3.

For each place enter each number by pressing that number and at the end of the row you must PULL LEVER.

The problem of getting lost in the large forest with the strange light is solved quite simply by not going there!

End of solution, end of game, end of column! See you next month.

Write: ADVENTURE

Pete Gerrard gets a game gang together

LAST month we had the minor problem of a dead Dragon and hence no programming. The month before that, however, I'd said that we'd be talking about introducing characters into a game and now with a happy Dragon once more by my side that's precisely what we're going to be doing.

In the October issue of *Dragon User* we touched on simple individual characters who performed simple individual tasks. They either attacked you or stole things from you or perhaps solved a riddle or two for you by carrying things, accepting things, performing some task that was beyond the talents of the main hero of the adventure — you! They might have been able to reach something you couldn't or possibly they had the ability to swim across a piranha-infested lake, but whatever it was it generally consisted of something that was pretty straightforward.

In short they didn't really do very much and programming that sort of character into your adventure is really quite an easy thing to do. More complicated are advanced characters or groups of characters although I noticed that the thirteenth issue of *Adventure Contact* (once a local adventure magazine now moved down to Bournemouth) did touch on this topic by giving us one way of having an individual adventurer join or, of course, leave a group of people in the game.

However there we had the group behaving very much as one would expect an inanimate object to behave: it was shunted from one room to another, and didn't really play much part in the game other than allowing someone to mingle and perhaps achieve something that would be impossible for a more conspicuous person roaming about by themselves.

So this month we'll be looking at more human characters or at least characters that have a touch of personality about them with perhaps a brief nod in the direction of having lots of characters time and space permitting of course.

Single Characters

I'm all for making adventures as realistic as possible and just as in real life we wouldn't expect anyone to carry more than about six bulky objects at a time. That is the limit we would impose on the program. But it doesn't seem to make sense to allow the person to carry anything else because he's holding too much. Bearing the immense load of six sheets of paper and failing to have the strength to pick up a key is clearly ridiculous as is the equally absurd situation of being able to take the strain of say six hundredweight bags of coal. So objects are given ratings which relate to their weight the player is given a strength factor and as his strength goes up and down during the course of the game he can carry more or less objects. All the time though the objects that he can carry have a practical limit imposed upon them: walk around with five hundred sheets of paper and if you want just one bag of coal. All of this brings us to one vitally important factor that we can give our intelligent single character, and that is the factor of strength.

Making him stronger than the adventurer means that he can carry something that the adventurer can't and thus he will have at least one thing to do in the game. Perhaps it might take two of you to carry a particular object from A to B: get our friend to help.

Help Offered

Intelligence which is obviously something you'll need to solve the game is something else that we can endow our characters with. It is after all one of the traditional six attributes that are imposed on players in the world of Dragons and Dragons and other role-playing games.

Suppose the player is faced with a conundrum. He might have to, for example, water a plant in order to make it grow but the only thing he can find to carry the water in is a bucket with a hole in it and however fast he runs he always finds that the water has run out before he gets there. Clearly the bucket has another purpose since there is nothing to block the hole up with or is there? Something else to think about.

Instead of using the more familiar HELP routine where the program usually prints up some inane comment about not understanding you or refusing to offer help unless you send off a postal order and take out a year's subscription to *Pigeon Fancier's Monthly* or something (just imagine all these blokes in bers, eyeing up pigeons saying cor I don't half fancy that one) you could have the other character offering help and advice when asked. Always provided he's around, of course, and hasn't got tired and listless by being asked to run around with rapidly emptying bucket of water. If he sits down and starts singing about gold, well that's your problem.

When I say ha, by the way this is not me being sexist or anything, I just hate writing out he or she' all that time. Use whatever sex you feel like. They both have their uses! Perhaps you might like to leave it to the player to decide and adjust a variable accordingly: less strength more intelligence or however you see fit. Don't all write in and complain at once.

Another of the constraints usually imposed upon you in a role playing game is that of dexterity hand-to-eye co-ordination that kind of thing. Thus you could easily give the player and the character a dexterity rating so that for example, a player with a low rating combined with a character who has a similar rating would not spot a trap until they fell in to it but two characters who are very dexterous could easily dodge life's slings and arrows of outrageous fortune and get on with things much more easily.

By giving the player and any other characters who come into the game these ratings of strength intelligence and dexterity you make the game much more realistic however un-realistic the setting for your adventure might be. Perhaps instead of setting the ratings for yourself you let the player choose his own giving him a maximum total of points to choose from. Someone might settle for lots of strength and have little left over for intelligence and dexterity, thus ending up like Benny out of Crossroads which is certainly a fate worse than death as I'm sure you'll agree.

Other players might opt for lots of intelligence, and end up with the strength and dexterity of a banana skin. The game thus becomes a lot more than a simple solve this problem, collect that treasure affair. The attributes for the characters in the game you would of course select for yourself in adventures as in life you can determine those of other attributes to large extent but you can't determine those of people which makes the adventure like life all that more interesting.

You might keep these three as three distinct variables each one being affected by the various situations encountered during a game. Eating and drinking might increase strength but decrease dexterity if you overdo it. Finding a book in a library or a map on the floor might increase intelligence and so on.

Cherecter Building

But all of this is to no avail if you don't tell the player what the character actually looks like. Saying a dwarf leaps out from behind a rock, and tells you that his name is Dimli Gloing (knew I'd get him in somehow!) at least makes you think of something typically dwarvish but saying a man walks out from behind a boulder and tells you that his name is John Smith gives you absolutely nothing to go on apart from the fact that he lurks behind boulders and pounces on unwary adventurers. I'm not implying that you launch yourself into screenful after screenful of Barbara Cartland style prose (heaven forbid) but you should give the player some kind of impression of his new acquaintance. He might be smiling or surly; bald or looking like Father Christmas; short or tall. It only takes a few words to convey the necessary information.

Having done all that you're in much more of a position to give your games that certain

something that all good adventures have lots of atmosphere It doesn t take massive room descriptions and hologram graphics to do that Just a little of common sense and some careful programming will do the job equally well

Balanced Talents

A realistic adventure is always going to be better (and sell more) than an unrealistic one and one way of doing that is to look after your characters Give them the various attributes and they become alive playing a real part in the game and apart from increasing the quality of the game they also allow you to set much more ingenious puzzles for the player to solve Never make it impossible of course because even if someone for whatever bizarre reason selects an intelligence of zero, they should still be able to complete the game You might like to compensate for the ratings that the player selects by choosing suitable ratings for your other character If the player decides to have no dexterity whatsoever you would give the other character the ability to carve a scale model of a spider s web with a blunt axe and a match Thus ensuring that everything remains the same overall and that every problem is therefore solveable One thing that we haven t really touched on and I m sure this will be a topic dear to our beloved editor s heart is the subject of women in adventures

Why is just about every [illegible] to the male persona and then [illegible] because they can t think of a [illegible] problems anymore? Okay two of the mighty Income adventures gave you the opportunity to choose between male and female and the game adjusted itself accordingly Or at least I hope so playing as a female I never made it to the sultan s harem in one of the games!

But generally speaking our typical adventure casts the hero as a male of the Rambo

[illegible] I can t spell Arnold whatever's the variety and I m sure there's mileage [illegible] had in exploring the female role And not just as the kind of female that adventure use when promoting Barbarian-type games either Maria Whittaker might earn five times as much as the prime Minister but then (as the *Mail on Sunday* put it) she s got five times as much on her front bench Many people find that sort of image offensive and just as not all male adventures look like Arnold so not all female ones look like Maria

Conclusion

I saw it quoted somewhere that around 30 per cent of adventurers are women Where they get these figures from I have no idea but there you go (*He's off about figures again — Ed*.) Thus there is obviously a lot of female interest out there and as I said it would give you some new problems to ponder rather than the usual adventure scenarios I m not suggesting that you go on an out and out feminist campaign but it would make a change Oh well having no doubt stirred up a hornet s nest I shall retreat quietly from the scene until another month rolls by There we ll get back to adding a few verbs to our adventure and give you another insight in to how a game is put together Plenty to think about in terms of characters (male or female) (*What about Luggage? Is this man is an objectist?*) so until then goodbye

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Continued from page 11

you to calculate the number of bytes yourself (BNE * –23, for example) but the easy way is to always give the destination instruction a label name and to branch to that. This way the assembler calculates the number of bytes between the destination and the branch instruction for us — and if we change the number of instructions between the two locations a re-assemble automatically generates the revised value whereas if we wish to be the computer and use the branch * + or * – form we need to check and re-evaluate new values prior to each assemble. There is a limitation on the distance between the branch and destination of +127 and -128 bytes from the end of the (2 byte) branch instruction (+ start of the instruction following the branch). However this does not limit our program capability as if greater distances are involved (and the assemble will usually flag an instruction as in error if the distance is exceeded) all the branch instructions may be prefixed with an L for Long (LBEQ/LBNE etc) These allow two bytes for the +/- value allowing distance of +32767 and –32768 bytes to be reached — which as the total memory of an unmodified Dragon is 65536 bytes enables every possible location to be reached

We have mentioned + and – numbers here which is where 'signed' and 'unsigned' values come in to focus. However if I start going into detail at this point the Editor's guillotine will come into greater focus so, sadly further detail will have to wait until next month.

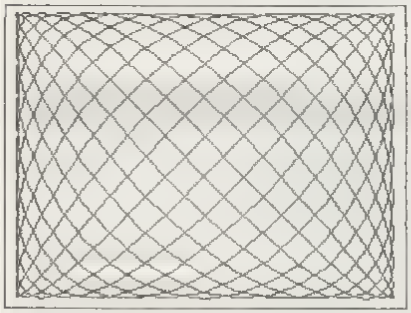
Workout

Meanwhile as programmers we need to protect our programs from operator misuse either accidental or deliberate. The PRINT@ code above contains a weakness that can be exploited by a user — have you found it? There is a check in the $800C routine that prevents the display of the left arrow causing the text pointer to fall down below address $400. However in the PRINT@256 version have you tried left arrow beyond the amount of data you have already (if any) input then carried out further keypresses? To prevent this we must decide either not to allow use of left arrow for erasure (unfriendly) or to insert our own check that if left arrow is received only allow it to be displayed (+erase) if there is data to be erased (current pointer contains value > $500). The CoMPare instruction cannot directly compare the contents of a single/double byte with another memory location or actual value one or other value must be in a register. We do not want to corrupt the contents of register A prior to knowing whether it is to be displayed or ignored so register D should not be used for the compare use register X. Try adding in instructions to the PRINT@256 version to both prevent use of left arrow for erasure and a further version to allow use of left arrow for erasure but to guard against backtracking beyond $500.

Next month at last we will make a start on tackling programs that won't run on our machines because of their position dependency.

Down in the dumps

***Dragon User** presents a screen dump for the Memotech DMX80*



BASIC is very good for screen dumps because it is so easy to alter to suit your own particular printer. As far as I know the Memotech is almost the same as the Panasonic and some Epsons, so I hope this dump is going to be useful to quite a few Dragon owners.

Although the dump takes 5 minutes (providing your Dragon can handle lines 40 and 130) to do a job, the beauty of it is that it can be altered so easily.

```
10 'SCREEN DUMP - MEMOTECH DMX80
20 'MIKE TOWNSEND - (C) - 4/6/87
30 PMODE4,1:SCREEN1,0:Y=0
40 POKE65495,0
50 PRINT#-2,CHR$(27);"@";
60 PRINT#-2,CHR$(27);"P";CHR$(0)
;
70 PRINT#-2,CHR$(27);"k";CHR$(0)
;CHR$(1);
80 FORX=0TO255
90 A=PPOINT(X,Y)*128+PPOINT(X,Y+
1)*64+PPOINT(X,Y+2)*32+PPOINT(X,
Y+3)*16+PPOINT(X,Y+4)*8+PPOINT(X
,Y+5)*4+PPOINT(X,Y+6)*2+PPOINT(X
,Y+7)
100 PRINT#-2,CHR$(A);:NEXT
110 PRINT#-2,CHR$(27);"A";CHR$(8
);:PRINT#-2,CHR$(10);
120 Y=Y+8:IFY>191THEN 130 ELSE70
130 POKE65494,0
```

LINE 50 resets printer. Clears any commands you have already given it.

LINE 60 sets printer to "Elite" mode, otherwise you get oval circles.

LINE 70 Standard bit image designation command.

LINE 80 to 100 collects the data from each row accross the screen, 8 pixels high.

LINE 110 set line feed to 8/72 inch, to get no gaps between the rows, and then gives the line feed command.

LINE 120 instructs the next line to be scanned or, if the whole picture is complete, ends the program.

Winners and Losers

Every month Gordon Lee will look at some prize programming

HOW do you perform a calculation such as $2^{75} * 5 + 1$ with absolute accuracy? This was the problem posed in August's competition and one method of solving this and other similar problems is discussed beginning on page 26 of this issue.

Having come up with a possible answer by whatever means this is one type of question in which it is not immediately apparent if the result obtained is the correct one. This proved to be the case in a number of incorrect answers which were received from readers who were clearly unaware that their solutions were wrong.

Fortunately there are a number of checks which can be applied in order to detect any possible error which might have been made. Note that the use of these tests does not guarantee that the solution is correct but they can often be used to eliminate an incorrect answer. If an answer posses all of these tests then the odds in favour of it being correct increase correspondingly.

So let's take the calculation given and apply some of these tests. Our first test would be to ask the computer to print out an approximate answer. PRINT 2^75*5

As this is still inside the overflow capability of the Dragon the answer 1.58894663E+23 is given. From this we now know that the correct answer begins with the digits 15889 — and the E+23 tells us that we need to move the decimal point 23 places to the right — to leave with a 24 digit number. In calculations of this magnitude don't assume that all of the digits displayed are the correct ones but you can be certain of the first few digits. Even if the computation were greater than the Dragon could handle we could still use ordinary common logarithms to give us an indication of the magnitude of the answer together with the first couple of digits.

Now we ought to turn our attention and look at the last few digits of the answer. The listing here performs the calculation given in the competition question but it restricts its attention to just the final few digits. Each time the calculation exceeds a total of six digits the excess are removed by use of the RIGHT$ command at line 50. Consequently the final six digits which are printed out are the precise six which will appear at the right-hand end of the final solution. We now know that the answer will be a 24 digit number in the form 1888...547841.

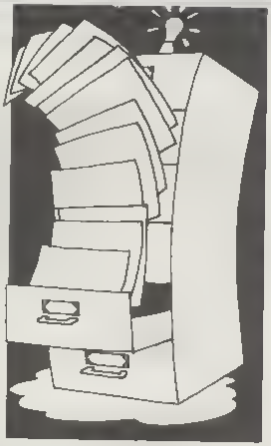
Having established the top and tail of the answer what about the middle? Unfortunately there is no easy way to determine this (except by solving the puzzle) — but there is a useful negative test which can be applied which uses digital roots.

The digital root or DR, of a number is the digit which remains when the are added together until a single digit remains. The digital root of the current year, 1988 is 5, since 1+9+8+8 = 26 and 2 + 6 = 8.

Whenever an operation is performed with two numbers the result is reflected in the corresponding digital roots. For example, if 1988, which has a DR of 8 is squared the answer will have a DR of 1, because 8 times 8 is 64 and 64 has a DR of 1. The correct answer 3952144 does indeed have a DR of 1. Otherwise we should check for an error.

We can now apply this test to the competition. First look at the first few powers of two: 2,4,8,16,32,64,128,256 and so on. These have digital roots which run 2,4,8,7,5,1,2,4 and so on. Not how they repeat in cycles of six numbers. This tells us that 2^6 has a DR of 1 as do 2^{12} and 2^{18}. This is true of any power of 2 in which the power is a multiple of six. This means that 2^{72} would have a DR of 1 and that consequently 2^{75} has a DR of 8. If 2^{75} is then multiplied by 5 (as in the next stage of the computation) the answer will have a DR equal to the DR obtained by multiplying our existing DR of 8, by 5 — ie a DR of 4. If 1 is added finally to this we get a DR of 5 which should be the root of the final answer (and indeed it is).

It must be stressed again that by passing all of these tests the solution is not definitely correct as two errors could cancel each other out, but it would give a strong indication that the answer was OK. However if any single test were failed then the answer would have been definitely wrong. When this was done to all of the incorrect answers submitted none passed all three of the tests.



```
10 N=1
20 FOR P=1 TO 75
30 N=N*2
40 N$=STR$(N)
50 IF LEN(N$)>6 THEN N$=RIGHT$(N$,6)
60 N=VAL(N$)
70 NEXT P
80 N=N*5+1
90 PRINT N
```

Communications

Write down your problem on the coupon below (as brief and legible as possible) together with your name and address and send it to Communication, 12/13 Little Newport Street, London WC2H 7PP.

Problem

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To help puzzled adventurers further we are now running an Adventure Helpline — simply fill in the coupon below stating the name of the adventure, your problem and your name and address and send it to Dragon User Adventure Helpline, 12/13 Little Newport Street, London WC2H 7PP. As soon as enough entries have arrived we will start printing them in the magazine.

Don't worry — you'll still have Adventure Trail to write to as well!

Adventure

Problem

Name

Address

Happy New Year

***Gordon Lee** can't even get to 1988 without making a puzzle out of it . . .*

WHENEVER the competition involves using numbers greater than those which the computer can normally handle we inevitably receive lots of letters from readers reporting that their attempts end in an overflow error report on the computer. So here is a step-by-step introduction to the method that the Dragon can use to perform computations on numbers with hundreds (or even thousands) of digits!

First of all it is necessary to understand the limitations of any micro. Ask it to multiply 7654321 by seven and it will display the correct answer but try to multiply this same number by *itself* and the answer given is only the approximation 5.858863E+13. The E+13 is the computer's way of indicating that the decimal point of the displayed value must be moved thirteen places to the right giving a real value of 58588630000000. This does not mean, of course, that the true answer ends in seven zeros, merely that the computer can only handle a relatively small number of digits with absolute accuracy. It is possible to coax a few more digits out of the computer as the internal registers contain more digits than are displayed on screen, but these cannot be relied upon to be accurate. The calculation therefore should only be regarded as correct to about nine significant figures. On practical level this would, for example, allow us to measure the length of the equator to an accuracy of a few feet — but in mathematical theory (and some of our competitions) this isn't enough!

One way of overcoming this problem is by using string variables to hold the digits being operated on. Clearly it is not possible to multiply, divide, subtract or in the mathematical sense, add strings, but by converting each digit to a numeric variable as it is required, large computations can be made. There is nothing complex in the mathematics either — the method being to simulate that used in the pencil and paper way of performing the calculation. Let's take a simple example of multiplying 987654321 by 4. Mathematically we would take each digit in turn, starting at the right hand end, and multiply by 4. Any product greater than nine would result in a 'carry' which would be taken on and added to the next stage of the calculation. Now look at **listing one** which performs the calculation using this precise

Listing 1

```
10 A$="987654321":B=4:Z$="":CARRY=0
20 FOR F=LEN(A$) TO 1 STEP-1
30 V=VAL(MID$(A$,F,1))*B+CARRY:CARRY=0
40 IF V>9 THEN CARRY=INT(V/10):V=V-CARRY*10
50 Z$=RIGHT$(STR$(V),1)+Z$
60 NEXT F
70 IF CARRY<>0 THEN Z$=RIGHT$(STR$(CARRY),1)+Z$
80 PRINT Z$
```

```
          7129076834  ... . .A$
          2763128729  ... . .B$
         64161691506  ..... L$(1)
        14258153668   .........L$(2)
       49903537838    .........L$(3)
      57032614672     .........L$(4)
     14258153668      .........L$(5)
      7129076834      .........L$(6)
    21387230502       .........L$(7)
   42774461004        ......... L$(8)
  49903537838         .........L$(9)
 14258153668          .........L$(10)
1969855701127376398 6 ........ Z$
```

Prize

IT's a while since [illegible] offer on the [illegible] author of the [illegible] *Wizard is Trapped*, [illegible] tapes and a set of [illegible] another 15 lucky winners [illegible] Crossnumber.

Rules

AS soon as you have *made* it across the gap from 1987 to 1988 (in fact, if your *DU* gets there on time, you can do it between the turkey and the pudding, if that's how you see your mum and dad), rustle up a printout for [illegible] what someone did last month and include the listing without an answer attached to it), with any program notes you want Gordon to read, complete the tiebreaker and whap it into an envelope marked JANUARY COMPETITION to the usual address.

For the tiebreaker I want you to write another verse to Jingle Bells or compose any other piece of Yuletide music

October winners

THIS proved a popular competition and saw a higher than usual number of [illegible] faces among the entries. We also had a good proportion of correct entries but boy, is a good thing we don't deduct marks for neatness (or whatever the opposite is. Neatless?)

The winners are:

Robin Telkman of Sale, John Smallwood of Preston (win again next month and save yourself a few bob, John!), C R Barber of Seville, Denis O Mulloy of Combarton, N J Welham of Bedford, Fred Willers of Yarnfield, O av Nielsen of Denmark, J Smith of Twyford, Alan Thomas of Staplehurst, Phil Sapiro of Liverpool, Austen Henderson of Bromsgrove, D J Grey of Middlesbrough, Mark Towlson of [illegible]

[illegible] Abdabs kindly donated [illegible] Computape one of [illegible] serving and most [illegible] See yez at the Show.

Solution

[illegible] solution

method but arrange it into a program which the computer can handle. Line 10 stores the nine-digit number in A$, and the digit by which this is to be multiplied is in the numeric variable B. The final product will be stored in string Z$, initially defined as a null string, and any carry in the string variable named variable again in turn as A$ is scanned. The loop (lines 20 to 60) takes each digit in turn from the right hand end, multiplies by B and adds the carry (if any). Note that in the carry is added it is reset to zero. The value of this individual calculation is checked to see if it is greater than 9 — else there is a carry to be taken on to the next stage. This is done at line 40 which also gives the revised value for V if a carry is made. Finally the resulting digit is converted to string format and is appended to the left hand end of Z$, thus building up digit by digit the final product.

Dragon ghost

The only irregular command in this listing is the use of the RIGHT$ instruction in lines 50 and 70. Regular readers of this column will realise that this is because of the 'ghost' blank character which the Dragon places on the left hand end of any string variable created by use of the STR$ command. Once the left hand digit in A$ has been reached it is then necessary to append any carry (if there is one) so that the final result is now held in Z$. It is important that this listing and the theory behind each of the instructions is understood before considering the next stage — that of the multiplication of two large numbers.

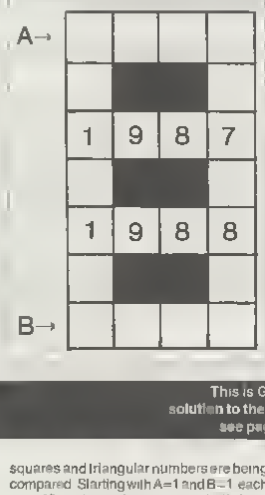
Figure one is a long multiplication of two 10-digit numbers much as it might appear if worked out longhand. By modifying **listing one** it would be an easy matter to store the second 10-digit number as string B$, and then take each digit in turn from this second string and multiply in the manner already outlined the value held in A$. The resulting sub-products could then be stored, for example in an array, before being finally totalled up to give the final result. The disadvantage of this is that memory needs to be used simply to store all of these sub-products until the final totalling.

1000 bytes

In the example given this is not a problem as there are only ten lines of digits each containing ten or eleven digits, but if the numbers being multiplied contained a hundred digits, it would be necessary to reserve 10,000 bytes of memory for this purpose. The way around this is to add each digit as it is computed immediately to the appropriate digit in the final product (Z$). In this way the whole need for the array can be eliminated and it is only necessary to reserve string memory for the two numbers being multiplied and the final product. In the case of the two 100 digit numbers mentioned this would only tie up 400 bytes — quite a saving on the 10K which would otherwise be necessary.

As an example of how this would work take the third column of digits from the right in the long multiplication shown. Here we have to add the digits 5, 6 and 8. The sum of 19 means that the 9 will appear as the third digit from the right in the final product and a 1 will be carried on to fourth position. This in turn will be the total of 1, 6, 3, and 2 plus the 1 carried, giving a final digit 3, with again 1 to carry.

In order to do this we need to initially define Z$ as a string of zeros long enough to contain the final product and to have a means of knowing the position within this string to which each individual digit must be added. Next month we will be taking a look at how this can be achieved.



Competition

To commemorate the start of the new year this month's competition is a crossnumber puzzle based on the year which has just ended, 1987, and the one which has just begun.

In the grid below these two dates have already been entered. What you have to do is to find two values A and B such that they and their squares can be fitted into the grid

The Answer

This is Gordon Lee's own solution to the November competition
see page 25 for results

ANSWER the boxes should be filled as follows

(a) Triangular/square 36, 1225, 41616
(b) Triangular/tetrahedral 10 120 1540
(c) Triangular/pyramidal 55,91 208335
(d) Square/cubic 64 729 4096
(e) Square/tetrahedral 4 19600
(f) Square/pyramidal 4900

SOLUTION The competition was related to the relationships between the five main types of figurate numbers. As was stated certain of these have been proved to be impossible and one — a tetrahedral number which is also pyramidal — although not disproven is extremely unlikely. If such a number exists it will be very large.

The list above in sections a to d give in each case the three smallest numbers (not counting 1). Sections e and f show the only possible answers that exist — a fact which has been proved mathematically.

The listing given compares two types of number and examines the relationship between them. Numbers which correspond are pointed out. In the example given the squares and triangular numbers are being compared. Starting with A=1 and B=1 each pair of figurate numbers is generated in turn. The logical method would be to generate one of these figures in turn and then test a series of the other type of number to see if the two values match. This would result in a lot of duplicate working by the computer so a much quicker method is used here. Note that TA is the value produced from A by formule 1 and TB is the value produces from B by formule 2. These two values are compared. If TA is the larger then B is increased before the next test. If TB is larger then A is increased. In this way the higher orders of figurate numbers can be tested without any duplication as the values leap/rog over each other in turn. If two values are found which match the result is printed out as these values are what we are looking for. When this happens one of the generating values is incremented and the search continues. In the program it is A which is increased but it could equally well have been B.

By changing the formulae in lines 20 and 30, the different relationships can be tested.

Listing A

```
10 A=1:B=1
20 TA=A*(A+1)/2:REM Put formula 1 here
30 TB=B*B:REM Put formula 2 here
40 IF TA=TB AND TA<>1 THEN PRINT A;"
   ";B;" ";TA
50 IF TA<TB THEN B=B+1:GOTO 30
60 IF TB<TA THEN A=A+1:GOTO 20
70 A=A+1:GOTO 20
```

Dragon Answers

If you've got a technical question write to Brian Cadge. Please do not send a SAE as Brian cannot guarantee to answer individual inquiries.

ROM can't be a RAM

I need a RAM pack for my Dragon 32 (only 8K is needed). Is it possible to remove the two eproms from my *Ghost Attack* cartridge and insert two 4K RAM chips to make $C000 to $DFFF RAM?

Are there any RAM packs for 8K available on cartridge?

Phil Callaghan
54 Pentvale Road
Moss Pit
Stafford

UNFORTUNATELY you cannot simply replace a ROM chip with a RAM chip, as the cartridge does not have all the necessary read/write circuits needed for RAM. It is certainly possible to attach extra RAM in cartridge form as all of the important 6809 pins are brought out at the cartridge port. The problem is that no one seems to make this (obvious) product for the '32 — unless one of our readers knows differently?

Binary coded decimal

I have recently started to write 6809 assembler and have come across binary coded decimal in some of the manuals I have. Could you explain what this is and what it is used for?

Eric Fields

IN the space I have here it isn't really practical to give a full blown explanation of Binary Coded Decimal (BCD), but I'll try and give you the absolute basics.

Normally, one byte stores a number from 0 to 255 using eight bits. In BCD the byte is divided into two four bit 'nibbles' which can each hold a number between 0 and 9 (the values 10 to 15 are not used in BCD).

For example, the number 57 would be stored in the following way in binary and BCD.

Binary 01000011 — 64+2+1 = 67
BCD 01100111 — 6 (0110) and 7 (0111)

Binary Coded Decimal was originally intended for use where exact precision was required but an obvious application for it is storing and updating a score in a machine code game. If you use standard binary then converting this into Ascii screen characters is not very simple however a BCD byte can simply be converted as follows (assuming BCD score is in B register (see listing one)

A special instruction DAA exists to adjust the accumulator after a BCD addition. So to add 5 to the score (again assumed to be held in B) the following routine could be used (see listing two).

Of course, only numbers between 00 and 99 can be stored in a BCD byte. I suggest you look at Programming the 6809 by Zaks for more information on BCD.

```
PSCOR TFR   B,A
      LSRA        * Get upper nibble
      LSRA
      LSRA
      LSRA
      ORA   #48   * Convert to ASCII Code
      JSR   PRT   * Print the char in A
      TFR   B,A
      ANDA  #15   * Get the lower nibble
      ORA   #48   * Convert to ASCII Code
      JSR   PRT   * Print this digit
      RTS

INCSC TFR   B,A   * Get score in A
      ADDA  #5    * Add 5 to it
      DAA         * Re-adjust back to BCD
      TFR   A,B   * Put back in B register
      RTS
```

Maplin muddle

COULD you help me with a problem I have interfacing the Maplin Dragon 32 I/O port to my Dragon 64? The instructions put the operation of this module at $C000 but I don't seem to be able to make the module work on my 64. I would appreciate your comments.

A. Atkinson
Knowle Cottage
Knowle Road
Kirkheaton
Huddersfield
W. Yorks

THIS is a problem which I've come across before (on an enhanced cartridge I reviewed a few years ago). On the Dragon 32 it is possible to interface an I/O port at address $C000 with minimal decoding. However, on the 64 the address select circuit is more complicated and I/O ports must be fully address selected using all 16 bits.

The problem seems to arise in circuits designed for the Dragon 32 before the 64 was released. Although valid for the '32, this 'quick and dirty' decoding will not work on the '64.

The sharps from the flats

I have a copy of the Composer program for my Dragon which I bought second hand. Alas I have no manual for this. I think I have just about to to know the whole system but although I can enter sharps in the data statements (# seems to do the trick) I cannot find how to enter flat or 'double dotted' notes. A single dot works for a dotted note but does not work for double dotted. Can you help?

Dave Lowe
Farm Cottage
Donisthorpe
N. Midlands

A flat note is denoted by an exclamation mark after it (eg A!5) in a similar way to a sharp note (eg C#4). Double dotted notes are marked with a colon (eg H:) at the end of the line.